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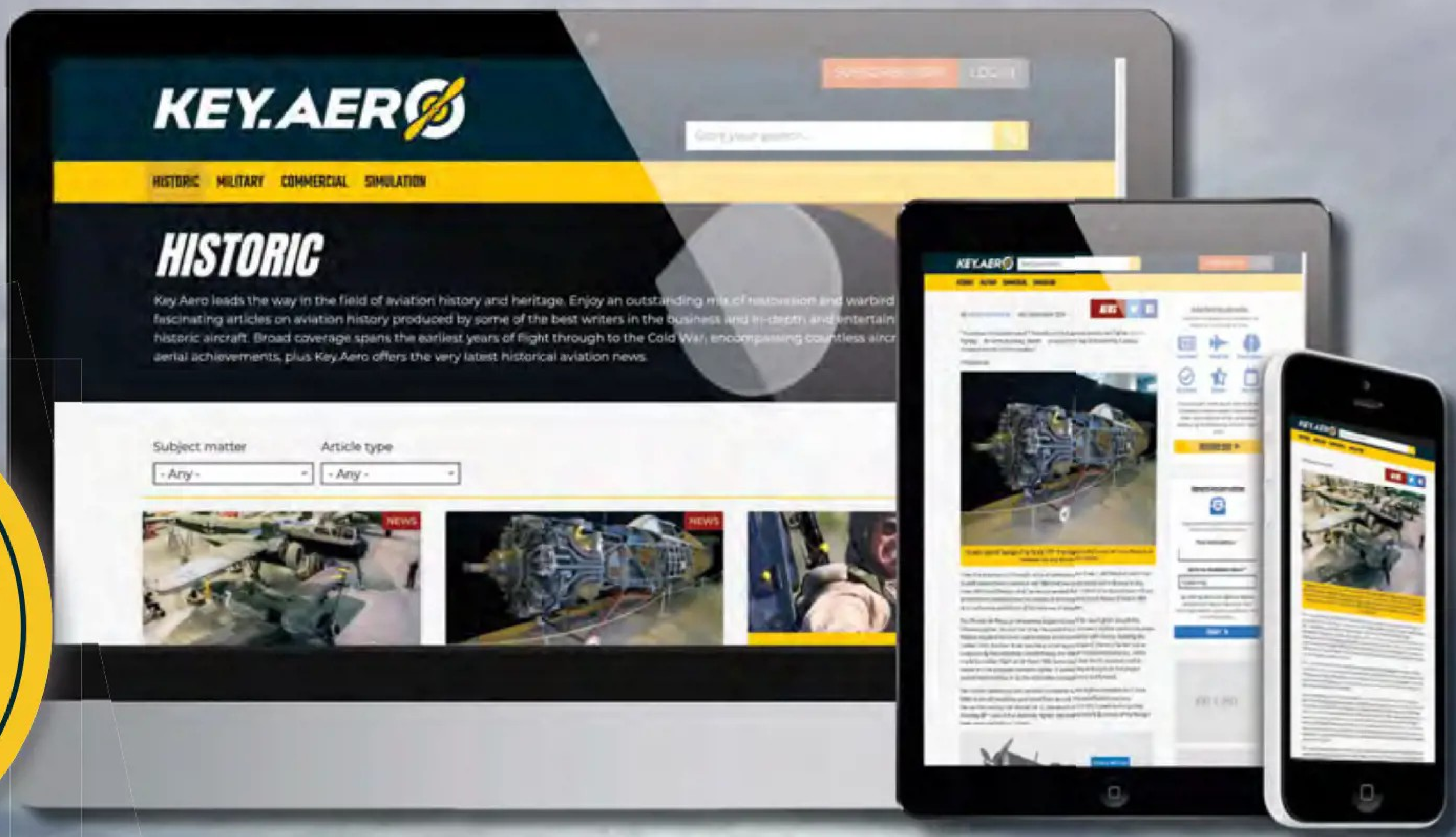

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497/21

Ukraine three years on

As the third anniversary of Russia's full-scale invasion of Ukraine approaches on February 22, the dire situation remains largely unchanged.

Despite Ukraine being supplied with F-16 fighters and array of Western missile systems, the conflict has descended into a grinding war of attrition (see p14-15) with neither side seemingly making progress in the war in the skies.

What is clear is that the might of the Russian forces has not been enough to crush any opposition from Ukraine (see *Still in the Fight*, p42) or even curtail its ability to control its own airspace.

Instead, we have a conflict that has seen an ever-greater reliance on unmanned aerial systems, kamikaze drones and long-range missiles. Russian aircraft have largely avoided entering Ukrainian air space to avoid contact with fighters and ground-based air defence systems.

At the same time, Ukraine has made use of British-made Storm Shadow missiles, as well as the French equivalent Scalp EGs, to launch attacks aimed at military infrastructure inside Russia.

Deliveries of F-16s are continuing and it is expected that several French Mirage 2000s will also join the fight on the Ukrainian side. Despite this, experts believe it will have little or no impact on the overall outcome of the war.

What is most likely is that newly elected US President Donald Trump will seek to end the war by holding talks with Vladimir Putin, which are likely to focus on Ukraine giving up territory held by Russia in exchange for a ceasefire.

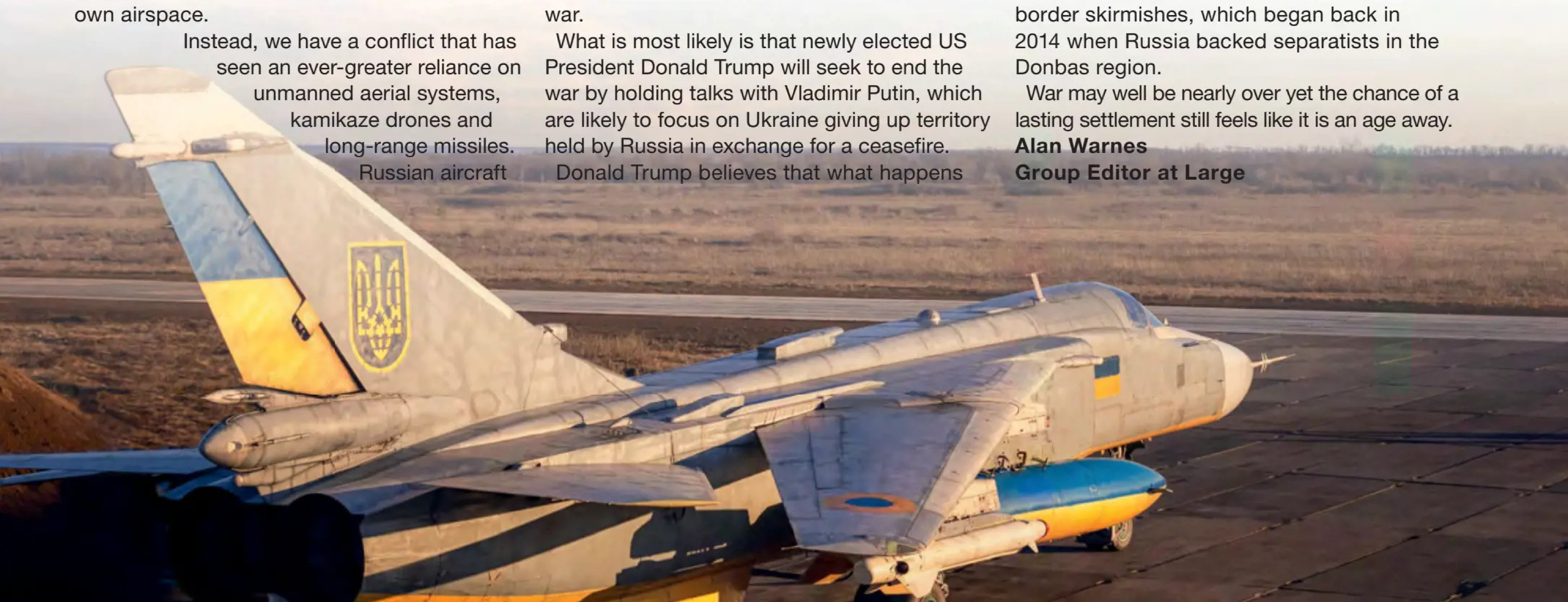
Donald Trump believes that what happens next is entirely a matter for European nations, although admitting Ukraine to NATO or the European Union seems unlikely due to the demands Russia will make for peace.

It will then be down to Europe to decide how it can come to the aid of Ukraine by modernising its armed forces, increasing the number of aircraft and missile systems it donates and hoping that it forms a great enough deterrent to prevent Russia from taking further action.

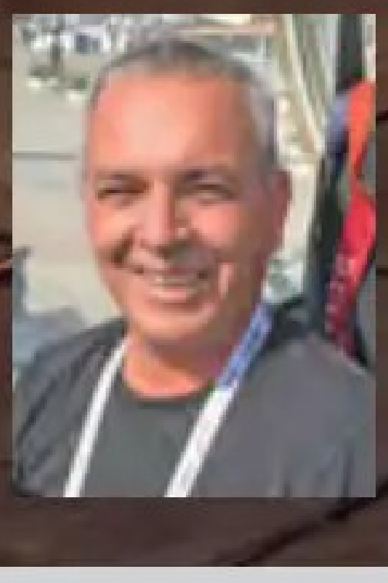
Peace may well be coming, but at a price. There is every danger the war of attrition will grind on but on the basis of continuous border skirmishes, which began back in 2014 when Russia backed separatists in the Donbas region.

War may well be nearly over yet the chance of a lasting settlement still feels like it is an age away.

Alan Warnes
Group Editor at Large



The sun may be setting on the ageing Russian aircraft being used by the Ukrainian Air Force, but even modern aircraft have not been enough to make a breakthrough



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***Main*: This F-35B (ZM154/'020') demonstrates the fifth-generation multi-role stealth fighter's unique STOVL configuration while preparing to land aboard POW after completing a mission as part of Exercise Nordic Response 24 on March 5, 2024** *MOD Crown Copyright/AS1 Amber Mayall*

***Cover*: Cover: A USAF F-15E Strike Eagle conducts combat patrols over the US Central Command area of responsibility on October 19, 2024** *USAF*

F-35 TR-3 upgrade facing further delays

OPERATIONAL TESTING of the latest generation of F-35 fighters may not start until 2026 because of continuing issues with its Technology Refresh-3 (TR-3) software and hardware, a damning report has revealed.

The Office of the Director, Operational Test and Evaluation (DOT&E) annual report said the issue means operation testing (OT) is expected to be two years behind schedule.

This means that TR-3 aircraft being delivered can only be used for training and exercise duties and are not combat-ready.

The report, published in the US on January 31, 2025, said: "The F-35 Joint Program Office (JPO) has not adequately planned for OT of the upgraded TR-3 hardware configuration to be completed prior to delivering multiple TR-3 aircraft to field units. DOT&E assesses that dedicated operational testing of these aircraft will not occur until mid to late FY26 (2026), approximately two years after the configuration began delivery to the field."

The report added: "The F-35 program has shown no improvement in meeting schedule and performance timelines for developing and testing software designed to address deficiencies and add new capabilities.

"Aircraft modifications, flight test instrumentation, [open-air battle shaping] capabilities and stable software will all be required before dedicated operational testing can begin on the TR-3 aircraft with the capabilities already fielded on the TR-2 aircraft," the report stated, while noting that such testing might start sooner if modifications and software mature faster than expected.

Issues with TR-3 led to a 12-month halt on deliveries, but this resumed in 2024 after the F-35 JPO decided that software in the jets was showing sufficient stability in test for safe flight operations and exercises.

An F-35A Lightning II assigned to the 56th Fighter Wing flies over Luke Air Force Base, Arizona *USAF/Airman Belinda Guachun-Chichay*

Accident investigation focuses on Black Hawk

AIR ACCIDENT investigators are examining the altitude of a US Army Black Hawk helicopter that was involved in a mid-air collision over Washington DC, which left 67 people dead.

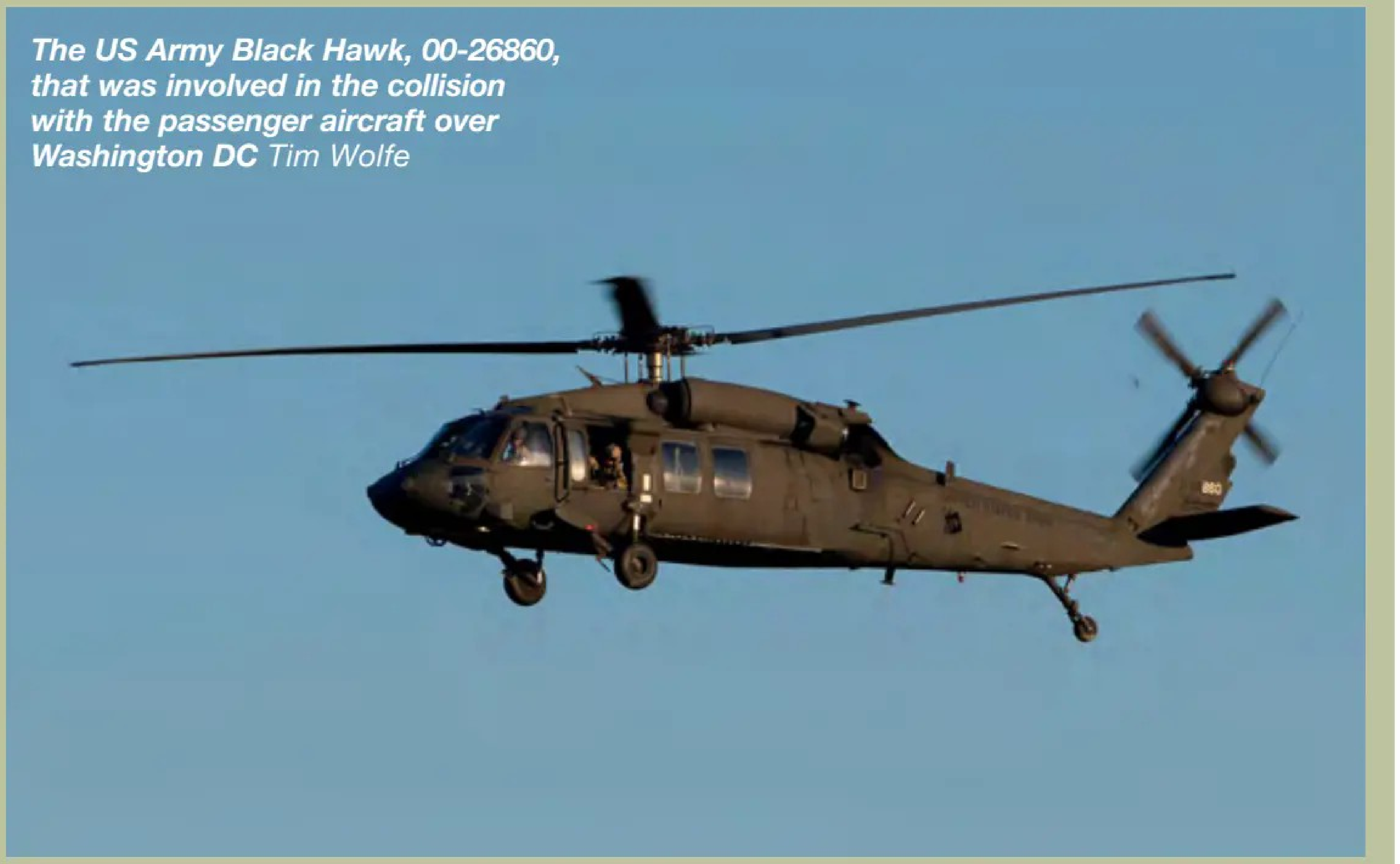
It is understood that experts from the National Transportation Safety Board (NTSB) and the Federal Aviation Administration (FAA) in the United States are investigating if the military aircraft was flying above its maximum 200ft ceiling during a night-time training mission on January 29.

Preliminary evidence announced by the NTSB found that the airliner was recorded at an altitude of 325ft at the time of the collision, but the Black Hawk was recorded at 200ft. Investigators are further examining details of the crash, the worst air disaster in the US for almost 20 years.

In a statement the US Army said: "While performing a training mission a United States Army UH-60 Blackhawk helicopter from 12th Aviation Battalion, Davison Army Airfield, Fort Belvoir, Virginia, collided in midair with an American Airlines Bombardier CRJ700 regional jet Flight 5342 last night at Ronald Reagan Washington National Airport. The FAA, NTSB and the United States Army will investigate. The NTSB will lead the investigation. We are working with local officials and will provide any additional information once it becomes available."

The helicopter, registered as 00-26860, operated under the callsign PAT25, indicating a Priority Air Transport flight – typically used for executive or senior US officials. However, no senior officials were on board at the time of the crash. The Black Hawk was operated by a three-person crew from General Support Aviation Company Bravo 'Black Sheep'.

At the start of February, the US Army named the Black Hawk commander as Capt Rebecca M Lobach. She was killed along with crew members Staff Sgt Ryan Austin O'Hara and Chief Warrant Officer 2 Andrew Loyd Eaves.



The US Army Black Hawk, 00-26860, that was involved in the collision with the passenger aircraft over Washington DC *Tim Wolfe*

US targets ISIS in Somalia

A US Navy F/A-18 is launched from the flight deck of the 'Harry S Truman' on February 1. *US Africa Command*

US NAVY jets have carried out a series of air strikes targeting Islamic State (ISIS) terrorists based in Somalia, US Africa Command has revealed.

No details of the aircraft involved have been disclosed but it is understood that F/A-18 aircraft were launched from the *Harry S Truman* aircraft carrier, which is in the Red Sea spearheading operations against Houthi rebels in Yemen who have been targeting commercial shipping in the region.

In a statement, US Africa Command said: "In co-ordination with the Federal Government of Somalia, US Africa Command conducted airstrikes against ISIS-Somalia on Feb 1, 2025.

"The command's initial assessment is that multiple ISIS-Somalia operatives were killed in the airstrikes and no civilians were harmed. US Africa Command takes great measures to prevent civilian harm. Protecting civilians remains a vital part of the command's operations to promote a more secure and stable Africa.

"US Africa Command will continue to assess the results of this operation and will provide additional information as appropriate. Specific details about the operation will not be released in order to ensure continued operations security."

Bulgaria receives first F-16

The first Bulgarian Air Force F-16D at the delivery ceremony in Greenville on January 31 *Lockheed Martin*

LOCKHEED Martin has handed over the first F-16 Block 70 jet to Bulgaria, marking a major step forward in the country's efforts to modernise its air force.

The delivery was celebrated in a ceremony on January 31 at Lockheed Martin's production plant in Greenville, South Carolina, attended by Bulgaria's Minister of Defence, Atanas Zapryanov, alongside American and Bulgarian leaders. F-16s are built by the Lockheed Martin team in Greenville. Bulgaria has ordered a total of 16 aircraft.

Lockheed Martin's Mike Shoemaker, vice-president and general manager – Integrated Fighter Group, said: "The F-16 will help the Bulgarian Air Force stay ahead of threats in the region and play a key role in the allied peacekeeping mission in Europe and around the world. The F-16 has proven its air dominance time and again, and the Block 70 version will give the Bulgarian Air Force a highly capable, combat-proven aircraft."

The Bulgarian Ministry of Defence said it expects that the first two F-16s will be delivered to Bulgaria by April. They are a single-seater C-model and a two-seat D-model.

Mr Zapryanov said the third F-16 is also ready, but it will remain at Greenville for the training of the Bulgarian engineering and technical staff. Five aircraft are also on the assembly line, so by the end of 2025 Bulgaria will receive eight F-16s that Lockheed Martin is producing under the first contract signed by the governments of Bulgaria and the United States in 2019.

"The F-16 Block 70 aircraft is a completely new, fourth-generation aircraft with enormous capabilities," Zapryanov said. "It is a multi-role fighter, unlike the Bulgarian MiG-29 and Su-25 that we have in service."

Lockheed Martin has a backlog of 117 F-16 Block 70/72 jets to be produced in Greenville, with 23 already delivered to international partners.

RAF Typhoons fly the flag for Britain

An RAF 6 Squadron Typhoon takes off for the first mission of Exercise Red Flag MOD/Crown Copyright

RAF FIGHTER jets have been in action over the Nevada desert in the US as Exercise Red Flag marks its 50th anniversary. Typhoons, Voyagers and personnel have joined their American and Australian counterparts to take part in Exercise Red Flag, which also marked 48 years of UK participation. This year's exercise ran at Nellis AFB from January 26 to February 7 and involved about 3,000 personnel, including over 370 from the UK and up to 100 aircraft conducting large force employment missions in a range of scenarios.

By challenging participants with realistic, complex and large-scale missions in one of the world's toughest combat training environments, Red Flag tests and develops the skills and integration of all the participating aircrews, controllers, technicians and support teams. RAF personnel of all specialisations are taking part, including 51 Squadron Rivet Joint crew, air operations controllers from 19 and 20 Squadrons and support staff and engineers from 6, 10 and 101 Squadrons. It will be followed by Exercise Bamboo Eagle, designed to put the lessons of Red Flag into in a combat-representative, multidimensional battlespace to conduct testing, tactics development and advanced training in simulated contested environments.

The USAF established Red Flag in 1975, after the Vietnam conflict had revealed that the first ten combat missions were the most dangerous for aircrews. So they created a way to recreate and rehearse these before the conflict started. The philosophy remains the same today and continues to provide a uniquely valuable experience for all participants. Generations of RAF aviators have attended this exercise over the five decades, and it continues to evolve and reflect the threats and challenges faced in modern operations. Missions are conducted at the Nevada Test and Training Range and further to the southwest where there is integration with maritime units.

Squadron leader Raeburn of 6 Squadron said: "The exercise is renowned for its use of aggressor forces, including simulated enemy fighter aircraft, ground-based radars and simulated surface-to-air missiles and even cyber and space-based elements that simulate threats for each mission. The Tactical Command and Control team's role is to manage and control all of those aircraft, alongside other elements and units working in the ground, maritime, cyber and space-based domains, to accomplish the mission. The scale and complexity of Exercise Red Flag Nellis cannot be replicated elsewhere, which makes it an outstanding place to build experience and reinforce a close working relationship with the US and Australia."

An RAF 10/101 Squadron Voyager prepares for a refuelling mission MOD/Crown Copyright

Royal Navy Commando Merlins declared combat ready

The Royal Navy's Commando Merlin has achieved full operating capability and has been redesignated as the Mk4/Mk4a MOD/Crown Copyright

UPGRADES ENABLING Royal Navy Commando Merlin helicopters to embark in and operate from vessels anywhere in the world in support of 3 Commando Brigade have achieved full operating capability (FOC).

On January 29, the Merlin Life Sustainment Programme (MLSP), overseen by Defence Equipment & Support (DE&S), the procurement arm of the UK Ministry of Defence (MOD), announced that it has now fully transitioned the AW101 MK3/Mk3a to an in-service capability platform designated Mk4/Mk4a Commando Merlin. In total, 19 Mk3 and six Mk3a Commando Merlins were upgraded to the Mk4/4a standard, ensuring the Commando Helicopter Force (CHF) has the capability to provide air manoeuvre support to 3 Commando Brigade Royal Marines and other UK forces anywhere in the world. The Commando Helicopter Force, the wings of the UK Commando Force, also supports the Carrier Strike Group, carries out search and rescue operations and takes part in counter-narcotics and anti-piracy operations, maritime security and hurricane relief support.

Following delivery of the final aircraft conversion in 2022, DE&S has overseen the retrofitting of integrated mission planning systems and integration of type-leading synthetic training equipment. The declaration of FOC confirms achievement of the Royal Navy's requirement and the achievement of system acceptance. Key original upgrades to the aircraft include a new folding main rotor head and folding tail, which allow two of the aircraft to fit on just one of the carriers' aircraft lifts, and an improved defensive aid suite with a system that warns against and locates hostile laser-guided weapons. These upgrades and the latest system integrations contribute to the Merlin Mk4/4A's reputation as the world's most advanced amphibious battlefield helicopter.

Capt Neil Mathieson, leader of the Royal Navy Merlin DT Team, said: "The key difference between the Mk3/Mk3a and the new variant is the fact that the Mk4/Mk4a has been fully ship-optimised to allow it to embark and more efficiently operate from Royal Navy vessels. This means the Mk4/Mk4a aircraft are globally deployable for all maritime operations. There have been significant changes to enable this, including the new folding main rotor head and tail. In addition, a brand-new suite of avionics has been integrated and obsolescence removed, aligning the cockpit to the Mk2 and extending the life of the platform to 2030."

Draken lands £173m Red Air contract

THE UK Ministry of Defence (MoD) has awarded a £173m contract to Draken to provide advanced military training for the RAF and Royal Navy. The five-year agreement, announced on January 29, will see Draken simulate air combat, missile threats and electronic warfare for RAF, RN and British Army personnel. Training exercises over the North Sea will use 14 Dassault Falcon 20 jets, eight L-159E Honey Badger fighters and one Diamond DA42, based at Teesside and Bournemouth airports.

During a visit to Teeside, defence procurement minister Maria Eagle said: "This investment delivers world-class training for our armed forces, while boosting jobs and national security. Aligned with our defence industrial strategy, it shows themilitary can be an engine for growth in every region."

The training will prepare UK forces to counter emerging threats, including protecting Carrier Strike Groups from missile attacks and enhancing battlefield reconnaissance. Exercises will meet NATO standards, with Draken replicating Red Air adversary tactics using advanced electronic warfare systems.

Air Vice Marshal Mark Flewin, commander 1 Group, said: "This partnership is fundamental to ensuring our forces out-compete adversaries. The training simulates contested environments critical for NATO readiness."

Interim Medium Speed Operational Readiness Training Services will run until 2030.

DRAKEN
G-DKNB
DRAKEN
G-DKNA

Draken will use its fleet of L-159E Honey Badger fighters based at Teeside Airport as part of the £173m contract Draken

Dutch to host Ramstein Flag

This year's exercise, which runs in conjunction with the Dutch-led Frisian Flag series, is designed to provide allied forces with advanced training in a complex, contested operational environment
Royal Netherlands Air Force

NATO Allied Air Command (AIRCOM) has selected the Netherlands to host the Ramstein Flag 2025 (RAFL25), the second-ever large-scale tactical-level live-fly Flag exercise to be held in Europe, from March 31 to April 11, 2025.

Originating in 1975, the Flag series of exercises conduct multiple scenarios designed to provide realistic combat settings. A Flag exercise involves participants from allied air forces and provides them with lifelike training in a complex, contested environment. Based on traditional designations of red, ie enemy, and blue, ie friendly, aerial systems simulate air defence assets that engage offensive or adversary assets.

Hosted by the Royal Netherlands Air Force (RNLAF), this event will involve more than 90 aircraft operating from 12 allied air bases supported by some 15 NATO nations.

This year's exercise, which runs in conjunction with the Dutch-led Frisian Flag series, is designed to provide allied forces with advanced training in a complex, contested operational environment. Priorities for RAFL25 include exercising Counter Anti-Access/Area Denial (C-A2AD), Integrated Air and Missile Defence (IAMD), Agile Combat Employment (ACE) and seamless information sharing across allied nations. These objectives reflect AIRCOM's focus on ensuring the air component's readiness to respond rapidly in Article 5 scenarios, where NATO's collective defence commitments are invoked.

Additionally, RAFL25 will exercise the NATO air component's agile and immediate ability to execute the first five days of an Air Tasking Order (ATO) during such a scenario.

General James Hecker, Commander, NATO Allied Air Command, said: "Ramstein Flag 2025 underscores the alliance's determination to adapt, evolve and deter potential threats across the Euro-Atlantic region. This year's exercise builds on the successes of Ramstein Flag 2024 and continues to push the boundaries of realistic, high-intensity training to enhance NATO's deterrence and defence posture."

Following the inaugural RAFL24, which involved 130 aircraft and more than 2,000 sorties in Greece, RAFL25 sets a new standard for operational integration across air, land, maritime, cyber and space domains. Scenarios will focus on defending NATO airspace and sovereignty, while executing distributed operations across NATO.

Unlike RAFL24, this year's iteration will involve 12 allied air bases across the alliance. NATO's airpower benefits from the unique capabilities of its 32-member nations, pooling together a wide array of assets from many different allied air bases. This covers nearly 25 million square kilometres of NATO territory to execute distributed operations in any scenario or contingency. Distributing air operations in various locations across NATO requires speed, flexibility and adaptability, which will be exercised during Ramstein Flag 2025.

The second Skyfox, serial 0478, pictured before its delivery to the Czech Air Force on January 28
Aero Vodochody

First Czech Skyfox jets delivered

The Czech Air Force has taken delivery of the first two of its latest Aero Vodochody L-39NG Skyfox training aircraft.

The first, serial 0477 (c/n 167017), was delivered to the Centrum Leteckého Výcviku LOM (CLV–LOM) at Pardubice Air Base on January 24, 2025.

The second, serial 0478 (c/n 167018), followed four days later. The new jets will be used for basic, advanced and combat training.

The aircraft are the first two of four ordered as part of an €83m contract. The contract includes post-warranty support, high-altitude and survival equipment, initial training for pilots and ground personnel, ground equipment, initial sets of spare parts and consumables, flight planning and analysis systems and a ground training system.

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Finnish Hornets deploy to Iceland

The Finnish will provide airborne surveillance and interception capabilities to meet Iceland's peacetime preparedness needs *Finnish Air Force*

THE FINNISH Air Force is to deploy F/A-18 Hornets to support the NATO Air Policing Mission in Iceland.

The deployment of four Hornets will be the first time Finland has sent combat aircraft to Iceland since it formally joined NATO on April 4, 2024. Materiel and personnel from Finland began to arrive in Iceland during January, while the four Hornets were also expected to arrive in the country then to 'bed in' at Keflavík Air Base. The air policing mission was scheduled to formally start in February.

Both the aircraft and the majority of the 50 personnel being sent to Iceland belong to the Lapland Air Wing (LapLsto, Lapin Lennosto), which includes the Hornet-equipped Fighter Squadron 11 (HävLLv 11, Hävittäjälentolaivue 11) within its order of battle.

Late in January the detachment was to be certified by NATO's northern Combined Air Operations Centre (CAOC) Uedem in Germany, part of NATO's Allied Air Command. Once approved the Finnish aircraft would be ready to man the Quick Reaction Alert (Interceptor) (QRA[I]) duty in Iceland for three weeks. The Hornets are to be used to defend NATO airspace in the Arctic Region and provide airborne surveillance and interception capabilities to meet Iceland's peacetime preparedness needs – known as ASIC IPPN.

Major General Timo Herranen, Commander of the Finnish Air Force, said: "Finland's participation in the NATO Icelandic Air Policing Mission will strengthen the Alliance's presence in the High North.

"The deployment will be a concrete example of Nordic co-operation and the Finnish Air Force's capability to carry out missions throughout NATO territory. The Norwegian and Danish Air Forces have regularly contributed to the air policing mission in Iceland, so this is a natural task for Finland as well. It is in line with Finland's objectives that NATO has recognised the strategic importance of the High North," he added.

On-site host nation support will be arranged by the Keflavík Air Base. During their time in the country, the Finns will work closely with the Icelandic Coast Guard and personnel from Control and Reporting Centre Keflavík. Iceland's Minister for Foreign Affairs, Þorgerður Katrín Gunnarsdóttir, said: "The participation of Finland in the Icelandic Air Policing Mission is a significant milestone, which demonstrates how Finland and Sweden's entry into NATO strengthens and deepens our defence co-operation and contributes to our security."

Dutch and Estonians join forces for F-35 duties

Four air policing F-35 jets stationed at Åmari were joined by four Dutch F-35s from Leeuwarden Air Base for the training event *Royal Netherlands Air Force*

AIR FORCE personnel in Estonia worked with Dutch colleagues on January 30, collaborating on F-35 fighter jets at Åmari air base for the NATO Air Policing Mission.

Four air policing F-35 jets stationed at Åmari were joined by four Dutch F-35s from Leeuwarden Air Base, Netherlands, for the training event based on Agile Combat Employment (ACE).

Dutch military personnel have been working with their Estonian colleagues while detached at Åmari, and for the first time aircraft technicians from the Estonian Air Force observed servicing on the fifth-generation aircraft alongside their Dutch counterparts. This event was significant for Estonian personnel, as the Baltic country does not have the F-35 jets itself.

Captain Maarek Kallas, Estonian Airfield Squadron Commander, said: "Today's training is special and important because, for the first time, Estonian Air Force specialists had the opportunity to participate in preparing the fifth-generation fighter jets, currently assigned to the Baltic Air Policing Mission, for rapid combat readiness."

"Co-operation with the Royal Netherlands Air Force has been extremely valuable in developing competence in cross-servicing modern aircraft on the ground and in preparing personnel to ensure allied aircraft are quickly combat-ready. The goal is to maintain the skills learned today by continuing similar trainings in the future," he added.

Austria chooses 12 Leonardo M-346FAs

***Austria has signed a deal to acquire 12 Leonardo M-346FAs that will be used as fast-jet trainers and for light fighter duties** Leonardo*

THE AUSTRIAN Air Force has selected the Leonardo M-346FA for fast-jet training and light fighter duties.

Announced on December 28, 2024, Austrian defence minister Klaudia Tanner confirmed a plan to acquire 12 M-346FAs as part of a 'government-to-government' acquisition with Italy.

A purchase price and delivery details for the 12 M-346FAs were undisclosed, with a Bundesheer statement saying contract details are "currently being negotiated with the Italian government".

The Bundesheer (Austrian Armed Forces) said: "Defense Minister Tanner is following the recommendation of the [Austrian] General Staff. The budget funds required for the purchase were already planned and approved in 2022 in the multi-year financial framework and the ÖBH 2032+ development plan."

Italy and Spain order new Eurofighters

ITALY HAS signed a contract to acquire up to 24 additional Eurofighter Typhoon aircraft for the Italian Air Force.

They are set to replace the country's Tranche 1 Eurofighters, which were delivered in February 2004.

The modernised aircraft will feature advanced avionics and sensors, as well as the capability to operate Brimstone III ground attack missiles and Meteor radar-guided air-to-air missiles.

They will also offer improved connectivity with other military platforms operated by the Italian Air Force.

Eurofighter general manager, Simon Ellard said: "The order will enhance the Italian Air Force's combat air capabilities and provide security for Italy, Europe and the NATO alliance."

Italy's acquisition comes just days after Spain ordered 25 more Eurofighter jets to modernise its air force, bringing its fleet to a total of 115 aircraft.

Babcock picks Pilatus for French training

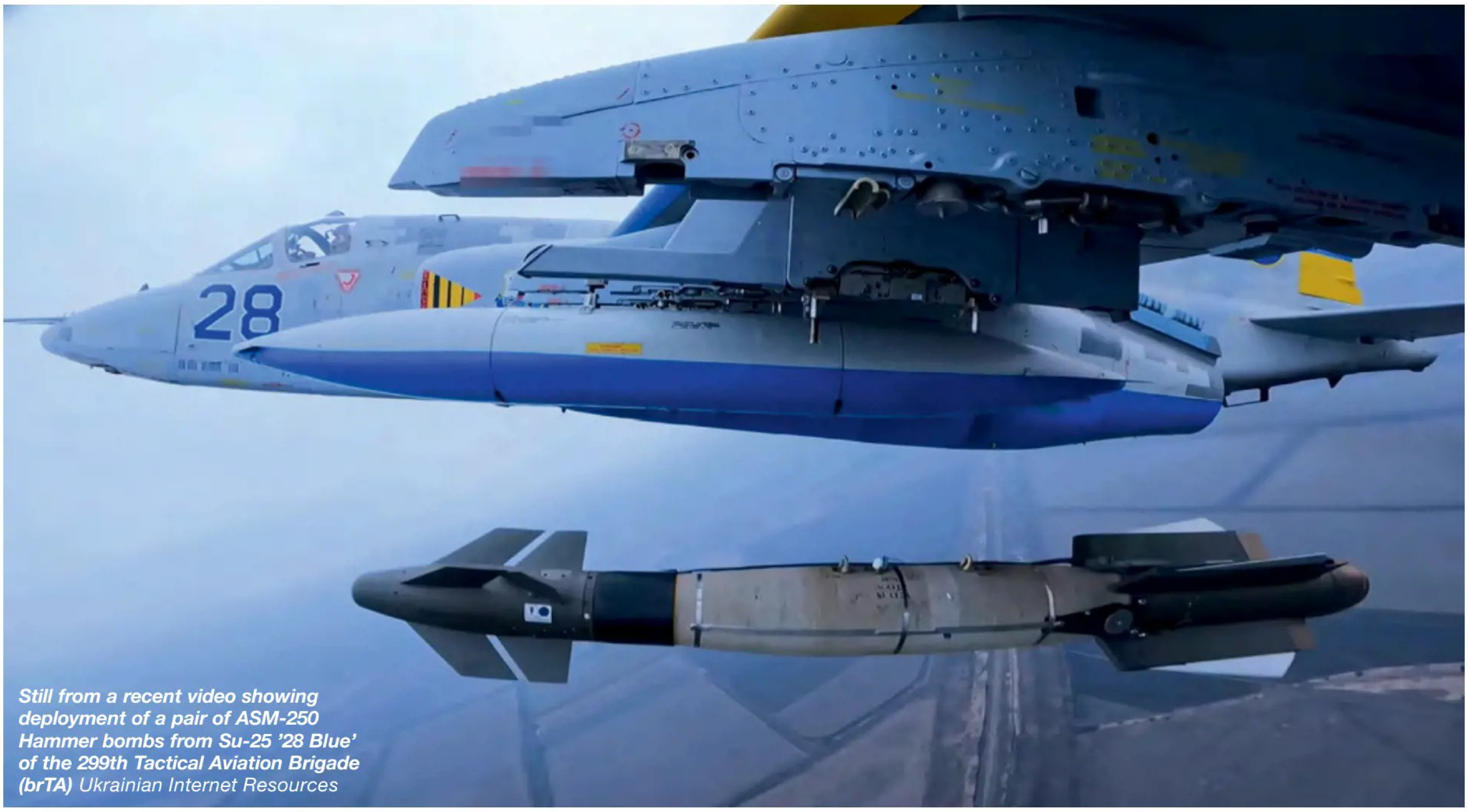
***The Pilatus PC-7 MkX turboprop training aircraft demonstrator high above the Swiss Alps** Pilatus*

IN LATE 2024 and early 2025, defence support group Babcock announced significant acquisitions to fulfil a new contract for the French military and for its international air academy.

The Direction Générale de l'Armement (DGA, French Armament Agency) announced on January 10, 2025 that it had awarded the Mentor 2 contract to Babcock International France Aviation. As part of the deal, the company will acquire 22 Pilatus PC-7 MkX turboprop trainers and 12 simulators, sourced from Exail, which will be based at Base Aérienne 701 Salon-de-Provence. Mentor 2 is a 17-year, €795m programme to support the training of Armée de l'air et de l'espace (French Air and Space Force) and Aéronautique navale (French Naval Aviation) pilots. The contract includes the provision of through-life support for the aircraft, infrastructure and pilot equipment. Around 100 new positions – including engineers, technicians, project managers and administrators – will be created in Salon-de-Provence and Le Cannet-des-Maures regions because of the contract.

The aircraft will be used to train pilots up to their selection for either fighter or transport streams. Approximately 120 students will receive training each year, with the PC-7s expected to accumulate 11,000 flight hours per annum as a result. A further 6,500 hours will be 'flown' by students in the simulators.

Commenting on the new contract, Babcock's chief executive aviation and CEO France, Pierre Basquin, said: "The French Air and Space Force and French Navy play leading roles in national and international security. We are delighted to support our customer with their air-based training requirements, further enabling them to focus on delivering critical military aviation needs. This new long-term contract underpins our strong relationship with the French Air and Space Force and places us as its main capability support partner in fighter pilot training programmes."



Still from a recent video showing deployment of a pair of ASM-250 Hammer bombs from Su-25 '28 Blue' of the 299th Tactical Aviation Brigade (brTA) *Ukrainian Internet Resources*

A war of attrition

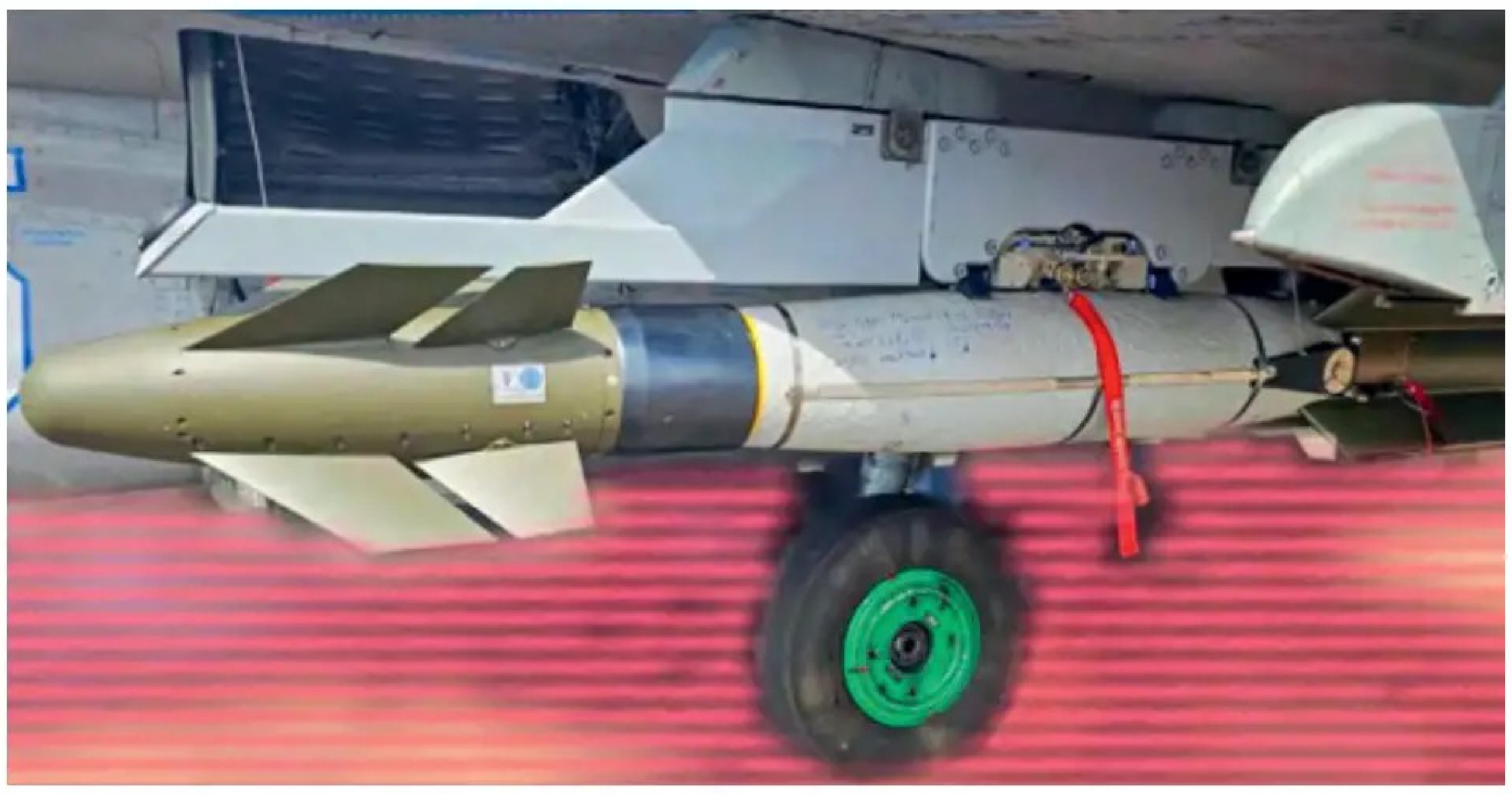
IN 2024, Russia intensified its pressure on the frontline in Ukraine, gaining well over 4,000sq km of Ukrainian territory. On January 6, 2025, this culminated with the capture of Kurakhove, a strategic city in the Donetsk Oblast, opening the road for further Russian advances against the regional capital, Pokrovsk. A day earlier, Ukrainian forces launched a renewed offensive in the Kursk Oblast of Russia – mixed reports have emerged about its outcome – but, on January 11, this resulted in the first capture of North Korean soldiers, who were shown to the public.

Both sides show no interest in stopping fighting and this three-year conflict seems to have become a war of attrition – the goal being to cause as much possible damage to the opponent, whether it be military personnel, civilian casualties, materiel or infrastructure. The ultimate winner will be the side with the ability to sustain heavy losses and replace them in a timely fashion.

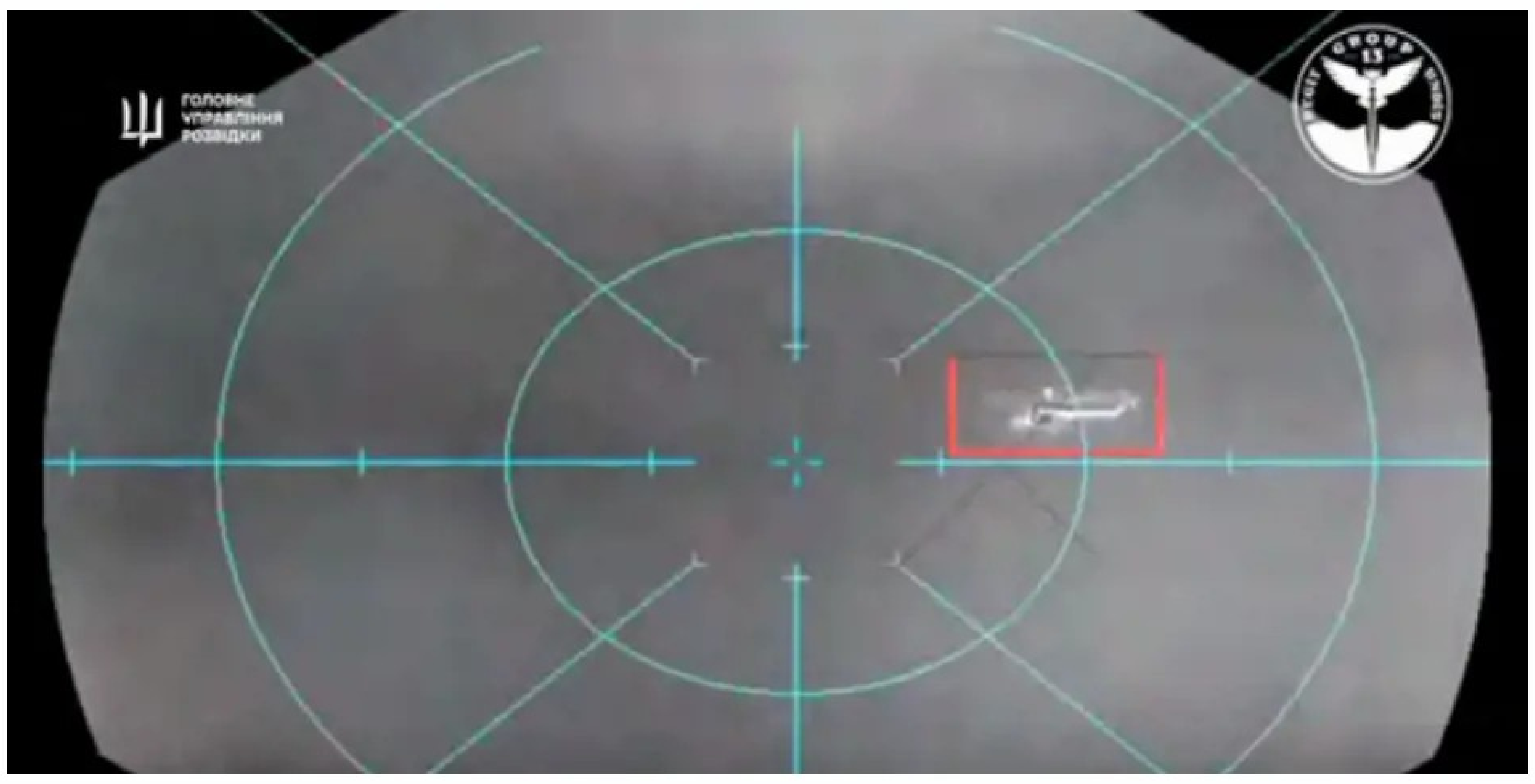
While Ukraine relies on its Western partners, who often show reluctance in their support, Russia is relying on pariah states like Iran and North Korea – the latter being the premier supporter, providing troops, munitions, surface-to-surface missiles (SSMs), artillery systems, armoured vehicles and, most recently, surface-to-air missile (SAM) systems. This gives Russia the confidence to continue its advance into Ukraine despite losses that reached record levels in 2024 – the losses in personnel alone are estimated at well over 400,000 men, more than half of the conflict total that reached 800,000 casualties in early January.

Russia

The Russian Aerospace Forces (RuAF) continue using their attack aircraft and helicopters for close air support (CAS) tasks along the frontline, predominantly in stand-off strikes, as well as its strike aircraft fleet to deliver so-called KABs on targets well behind the frontline. The KABs are standard RuAF iron bombs, converted into guided glide bombs by adding an UMPK kit. In November 2024, the official go-ahead was given by the US (see *Ukraine and Russia exchange long-range missile strikes*, *AFM*, January 2025, p6) to allow Ukraine to use long-range air-launched cruise missiles (ALCMs) and SSMs either built



Along with the US-built GBU-62 Joint Direct Attack Munition - Extended Range (JDAM-ER) bomb, the ASM-250 Hammer is also regularly deployed by the UkrAF's MiG-29 Fulcrums *Ukrainian Internet Resources*



Left: ***A US-built GBU-39 Small Diameter Bomb (SDB) is deployed from a Su-27*** *Flanker* ***which carries up to eight such bombs, four on a BRU-61 rack under each wing*** *Ukrainian Internet Resources*

Above: ***Still from a HUR MOU video, showing a Russian Mi-8*** *Hip* ***being downed by an R-73 AAM fired from a MAGURA V5 'kamikaze' drone on December 31*** *HUR MOU*

by the US or containing US-built/designed parts and this had a clear impact on the so-called 'Russian KAB menace'. After reaching an all-time record of more than 5,000 KABs dropped against Ukrainian targets in October, both on Ukrainian and captured Russian territory in the Kursk Oblast, in November these were reduced to almost 3,700 and plummeted down to just 1,800 in December, with slight rises being noted in January (the figures exceeded 2,600 by January 27). While other factors could also be at play here, the fact that RuAF's strike aircraft now have to operate from bases outside the range of these missiles clearly contributed to this considerable reduction.

Despite this, Russia continues to terrorise Zaporizhzhia – capital of Zaporizhzhia Oblast, a mere 50km from the frontline – including using long-range KABs. In what was the most serious incident so far, on January 8 a pair of KABs struck a residential area of the city, killing 13 and injuring over 100 people, many of whom were hospitalised in serious condition.

On the other hand, the Shahed-136 (Geran-2) 'kamikaze' drones in combination with various decoys, continue to exert constant pressure on the air defence (AD) assets of the Ukrainian Air Force (UkrAF) as they are launched almost every day. After a monthly record in November (a total of 2,363 drones launched), the daily record of 193 drones was set on December 13 during a large combined missile and drone attack which involved 94 various munitions, including ALCMs. With the total reaching almost 2,300 drones launched by January 27, it appears that a new monthly record will be set by the end of the month.

Ukraine

Ukraine continues to use all kinds of long-range weapons to attack various high-value targets in Russia proper, including UK/French-built Storm Shadow/SCALP-EG ALCMs and US-built ATACMS SSMs. Such targets include military and oil industry facilities, RuAF air bases and AD assets, munition storage facilities and command and control centres. The most notable UkrAF sorties with ALCMs include the ones on December 26 and January 26, when a storage, maintenance and repair facility for the Shahed-136 'kamikaze' drones was attacked in the Oryol Oblast of Russia.

On January 14, in what Ukraine described as their largest-ever attack on Russian military facilities, at least six Storm Shadow and six ATACMS missiles were used in combination with at least 146 drones, striking numerous military and oil industry facilities throughout Russia.

In addition to launching ALCMs, a task exclusive to the Su-24 *Fencer* fleet, the UkrAF continues using Western-supplied guided glide bombs deployed not only by MiG-29 *Fulcrum* and Su-27 *Flanker* fighters, but also Su-25 *Frogfoot* ground attack aircraft. The latter began deploying French-built AASM-250 Hammer guided glide bombs in 2024, when the stocks of unguided air-to-ground weapons were depleted. This was confirmed in a recent video showing one of a few stored Su-25s ('28 Blue') that returned to service after undergoing an overhaul following the Russian invasion. The aircraft is seen performing the standard manoeuvre for deploying AASM-250s: a sharp, high-speed climb at an angle of 45° or more, with weapons released at a certain altitude and subsequent immediate decent to low-level flight. All this is done extremely close to the frontline in order to maximise the bomb's range, so countermeasures are used throughout the climb/descent process. As a proof how dangerous these missions are, a number of UkrAF aircraft have been lost on such bombing runs, including the latest confirmed loss of a Su-25 ('27 Blue') flown by Capt Vladyslav Solop, shot down on December 14 in the Kherson Oblast.

Last but not least, the UkrAF continues receiving F-16s, with a new batch of ex-Danish aircraft arriving by December 7 and one more lot of ex-Dutch aircraft ready for delivery, enabling the UkrAF to score a remarkable record while fending off a large Russian missile/drone attack on December 13. The first Mirage 2000 multi-role fighters are also expected to arrive from France in the first quarter of the year.

Vladimir Trendafilovski

A Storm Shadow/SCALP-EG ALCM on its way to Russia in December 2024 *UkrAF Command*

A Ukrainian victory at sea

On December 31, a MAGURA V5 naval 'kamikaze' drone armed with an R-73 (AA-11 *Archer*) Infrared-guided air-to-air missile (AAM) operated by the Main Directorate of Intelligence of the Ukrainian Ministry of Defence (HUR MOU) managed to shoot down at least one Russian Mi-8 *Hip* helicopter, which can be seen on a video they published. This happened in the Black Sea, off Cape Tarkhankut in Crimea.

A second Mi-8 was initially claimed damaged, but was subsequently claimed as destroyed. Although this could not be verified independently, some Russian social media channels confirmed that two Mi-8s were lost with their crews. In addition to R-73 AAMs, the MAGURA V5 drones have also been armed with remotely-operated machine guns which are also used for defence against Russian helicopters or aircraft sent to destroy them.

MAFFS Hercs activated for firefighting

A C-130H equipped with MAFFS from Nevada ANG's 152nd Airlift Wing departs Reno-Tahoe International Airport on January 11 to assist in fighting California wildfires *USANG/MSgt Garrett Wake*

US Northern Command activated eight Air National Guard (ANG) and Air Force Reserve (AFR) Command C-130 aircraft equipped with Modular Airborne Fire Fighting Systems (MAFFS) to support wildfire suppression efforts in southern California on January 9. The aircraft were relocated from their home stations to the Channel Islands Air National Station at Naval Base Ventura County-Point Mugu north of Los Angeles. During the initial two days of operations, the ANG aircraft flew six MAFFS missions, dropping more than 16,000 gallons of fire retardant.

The aircraft included C-130Js from the California ANG's locally based 146th Airlift Wing and C-130Hs from the 152nd Airlift Wing's 192nd Airlift Squadron in Reno, Nevada, 153rd Airlift Wing's 187th Airlift Squadron in Cheyenne, Wyoming, and the 302nd Airlift Wing's 731st Airlift Squadron at Peterson Space Force Base, Colorado.

The MAFFS unit can discharge 3,000 gallons of water or fire retardant in less than five seconds and each drop can cover an area more than 1,300ft long and 100ft wide. Eight US Forest Service-owned MAFFS units are divided evenly between each of the units that support national firefighting response when requested by the National Interagency Fire Center (NIFC) and approved by the Secretary of Defense.

Support of civil authorities is a valued part of the homeland defence mission in support of the Federal Emergency Management Agency (FEMA) and the NIFC. The C-130s joined HH-60G, UH-60M and CH-47F helicopters from the California Air and Army National Guard and a large array of government and contractor-operated fixed and rotary wing aircraft that were already fighting the massive wildfires burning in several areas surrounding LA.

A California ANG HH-60G assigned to the 129th Rescue Wing's 129th Rescue Squadron prepares for a repositioning flight to a California Department of Forestry and Fire Protection helibase on January 10 *USANG/SSgt Crystal Housman*

Japan and South Korea fly with USAF

Fighter aircraft from Japan and the Republic of Korea conducted a trilateral escort flight of US bombers operating in the Indo-Pacific on January 15, 2025. Two Japan Air Self-Defence Force F-2s and two Republic of Korea Air Force F-15Ks escorted two USAF B-1B Lancers. In a statement, the USAF said: "This first flight of 2025 builds upon a history of strong trilateral co-operation, enabling an immediate co-ordinated response to regional security challenges. The increasingly steady and sophisticated trilateral interoperability of our aerial and maritime forces strengthens our collective deterrence and defense posture. Our three nations maintain an absolute commitment to the shared vision of a secure, rules-based, free and open Indo-Pacific region." *USAF/TSgt Stephanie Serrano*

Green Mountain Boys deploy

An F-35A Lightning II assigned to the 134th Expeditionary Fighter Squadron taxis past A1C Connor Blevins at Kadena Air Base, Japan *USAF/SrA Tylir Meyer*

The Vermont Air National Guard marked the start of its first operational deployment with the F-35A, when ten Lightning IIs operated by the 158th Fighter Wing's (FW) 134th Expeditionary Fighter Squadron (EFS) arrived at Kadena Air Base in Japan on January 13, 2025. The Lightning IIs are replacing F-35As from the 388th FW at Hill AFB, Utah. During the agile combat employment (ACE) deployment, the air guard jets will integrate with F-22As from the 3rd Wing's 525th EFS and F-16Cs from the 20th FW's 77th EFS that are also operating from Kadena.

New electronic warfare contract awarded

A $615.8 m deal has been signed by the USAF with Boeing to produce and install a new F-15 electronic warfare system known as the Eagle Passive Active Warning Survivability System (EPAWSS). This comprises two kits manufactured by BAE Systems, which consist of integrated radar warning, geolocation, situational awareness and self-protection equipment. EPAWSS is standard equipment on the new F-15EX, but the USAF is also upgrading 99 F-15E Strike Eagles with the advanced technology.

EPAWSS is the technology that turns the F-15EX into a generation-4.5 fighter, positioning it between conventional fourth-gen F-15s and fifth-gen F-22s and F-35s. The USAF says the technology can enable jets to "deny, degrade, deceive, disrupt and defeat radio frequency (RF) and electro-optical/infrared threat systems within contested and highly contested environments."

Growing competition in the electromagnetic spectrum has set off something of an EW arms race, and the USAF and its suppliers have not released details about specific EPAWSS capabilities. Nevertheless, one known capability is 'cognitive EW': the ability for the system to understand new threats and adapt its response without human input.

Red Hawk production slips again

Boeing test pilots conduct taxi tests of the T-7A Red Hawk at the Boeing aircraft delivery centre in St Louis, on, June 22, 2024 *Boeing*

U.S. AIR FORCE
USAF
7002

The USAF is once again making changes to its acquisition plans for Boeing's T-7A trainer. Under the latest modification, the service is slipping the start of Red Hawk production by a year. As a result, the release of the first production contract will be delayed until fiscal year (FY) 2026. The air force had planned to buy seven Lot 1 production T-7As during the current FY 2025.

To ensure that production and initial operational capability (IOC) will not be delayed further, four T-7A production representative test vehicles (PRTV) will be ordered using FY 2025 research, development, test and evaluation (RDT&E) funds. Boeing delivered the last of the five original engineering and manufacturing developmental (EMD) aircraft to the USAF in December 2024. Developmental flight testing began in June 2023 and has primarily been conducted at Edwards Air Force Base, California, since November that year, when the USAF formally took possession of the first aircraft.

The USAF awarded Boeing a $9.2bn fixed-price contract for T-X Trainer development and ten fixed-price lots covering the production of 351 T-7A aircraft in September 2018. Air force pilots are currently flying five test aircraft, with the last one delivered in December 2024.

At the time of the contract, Boeing was already flying two so-called 'production-representative' T-7s that were built with company funds. At the time, Boeing claimed its use of digital design tools enabled the program to go from the drawing board to first flight of the prototype in three years and "revolutionized aircraft design".

The T-7 encountered numerous problems during early testing, including issues with the flight control and ejection systems, as well as delays with the supply chain. Recent problems have centred on flight control issues when the aircraft is operating at high angles of attack and required updates to the trainer's flight control software.

These issues have resulted in multiple delays to the planned date for IOC, which slipped from the end of FY 2024 to the middle of 2028. The service is currently hoping to speed up the testing in order to reach IOC by 2027. It claims the expanded test capacity offered by the four additional aircraft will permit Air Education Training Command (AETC) to expedite test plans and curriculum development earlier than the current plan and allow the program to "achieve a timely IOC".

The USAF's assistant secretary for acquisition, technology and logistics commented: "Procuring these PRTVs in FY 2025 also allows the air force and Boeing to improve manufacturing readiness prior to entering the production phase for the entire run of over 350 T-7As. Decreasing overlap between development, testing and production lowers the likelihood of potential costly retrofits of a significant number of aircraft."

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First UAE Rafale unveiled

THE INITIAL Rafale F4 for the United Arab Emirates was unveiled at a ceremony in France on January 29.

The aircraft will remain at Dassault Aviation's Flight Test Centre to perform flight tests in view of the first deliveries to the UAE Air Force & Air Defence that are scheduled at the end of 2026.

Dassault Aviation CEO Éric Trappier joined French Armed Forces Minister Sébastien Lecornu and UAE Defense Affairs Minister Mohamed bin Mubarak Fadel Al Mazrouei in launching the new aircraft.

The new fighter will add to the UAE's existing Mirage 2000 fleet and future US-made F-35s.

It will be used for testing before the start of deliveries of the 80 Rafales ordered under the €17bn contract signed in December 2021 for 80 Rafale F4s. These are expected to begin from 2027.

The UAE Rafale F4 at the ceremony in January this year *Dassault*

Jordan launches Gaza air bridge

Dutch specialists with one of the Jordanian Black Hawks used to deliver urgent supplies *Dutch Ministry of Defence*

Jordan has set up an air bridge with helicopters between Amman and Gaza, which has been hit by war violence. Since January 28, 2025, several aircraft have been transporting aid supplies. At Jordan's request, two Dutch military specialists are involved in planning the flights. The duo has been added to an international planning cell.

On the first day of helicopter operations, 16 Black Hawks from the Royal Jordanian Air Force flew missions to deliver medical equipment and other urgently needed supplies directly into the Gaza Strip.

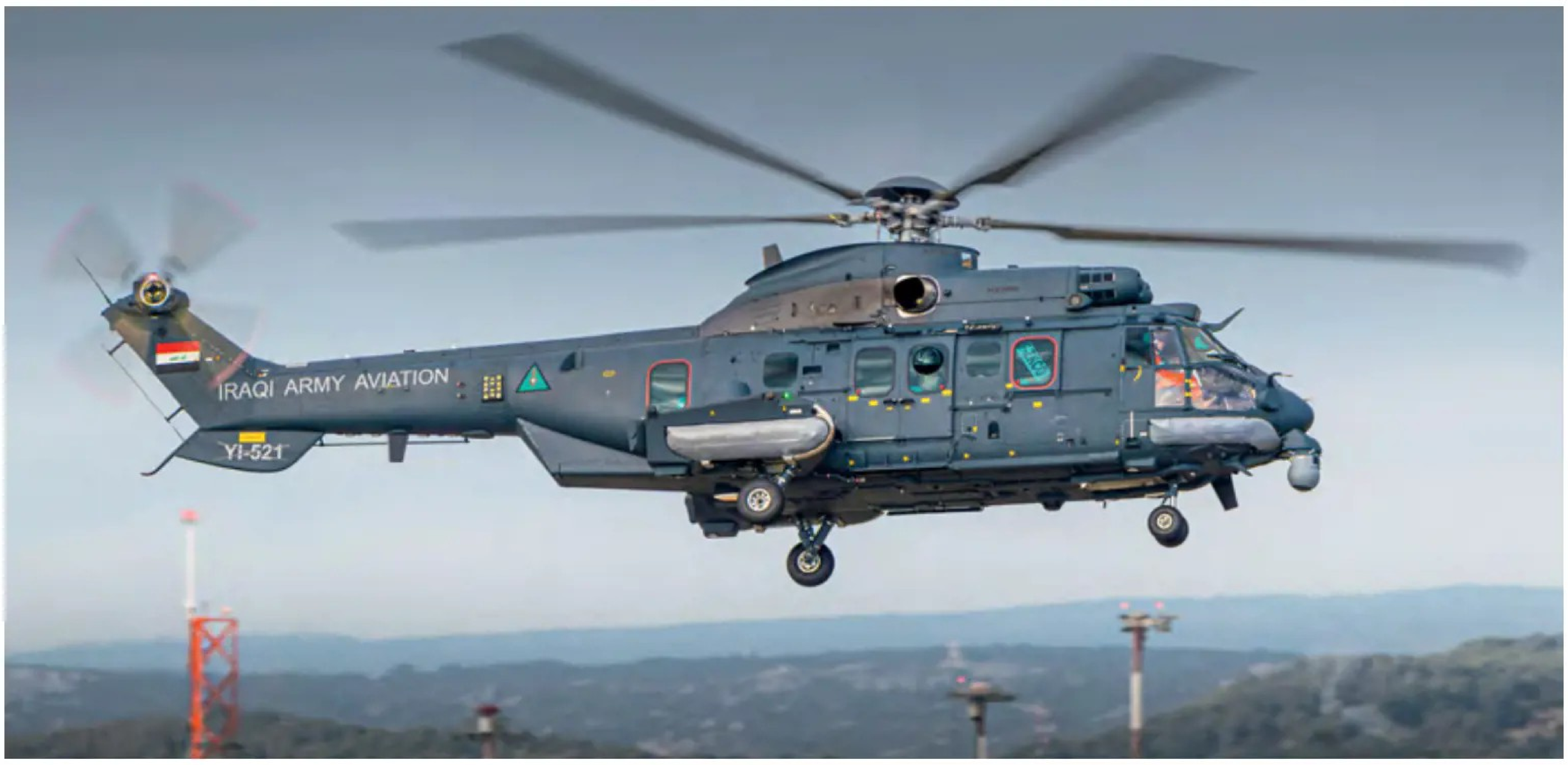
The ceasefire between Israel and Hamas has made it possible to deliver more aid, which was travelling by road for more than a week but is now also arriving by air.

Elbit wins Israeli F-16 upgrade contract

THE ISRAEL Ministry of Defence has awarded Elbit Systems a contract worth approximately $80m for the development and initial installation of an advanced airborne self-protection suite on the F-16I fleet.

Under the contract, the company will equip the Israeli Air and Space Force with cutting-edge suites designed to further boost survivability of the F-16I aircraft, enabling it to operate safely in hostile environments. The suite will include a state-of-the-art electronic warfare solution integrated with an advanced, electro-optical, Passive Missile Warning and Launch Detection System (PAWS), enabling enhanced protection from a wide range of threats bolstering the safety of both aircrews and platforms.

Iraqi Caracal revealed



THE FIRST H225M Caracal for the Iraqi Army Aviation Command (IAAC) has taken to the skies for flight testing.

The rotorcraft is part of multiple helicopter deals to re-equip the IAAC. Besides nine Bell 407s, 12 Bell 412s and eight additional Bell 505s, a dozen newly built and two second-hand refurbished H225M Caracals were ordered. Fourteen long-range tactical transport helicopters will be added to the Mi-17/-171 fleet of the IAAC.

The first H225M for the IAAC (Airbus test registration F-ZKCO and future YI-521), was pictured during a test flight over Marseille, France, on January 24, 2025. *Romain Boghossain*

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Entebbe, Uganda

A large number of air force and UN aircraft can be found at Uganda's Entebbe Airport, as Dr Andreas Zeitler discovered when he spent time at this rarely visited location in December.

Entebbe is Uganda's only international airport and serves the capital Kampala and its more than four million inhabitants. It is also the main air base of Uganda's People's Defence Force (UPDF) Air Force, more commonly known as the Ugandan Air Force (UAF).

For supply flights to South Sudan the Royal Canadian Air Force (RCAF) currently provides a C-130J Hercules (130614) to the UN

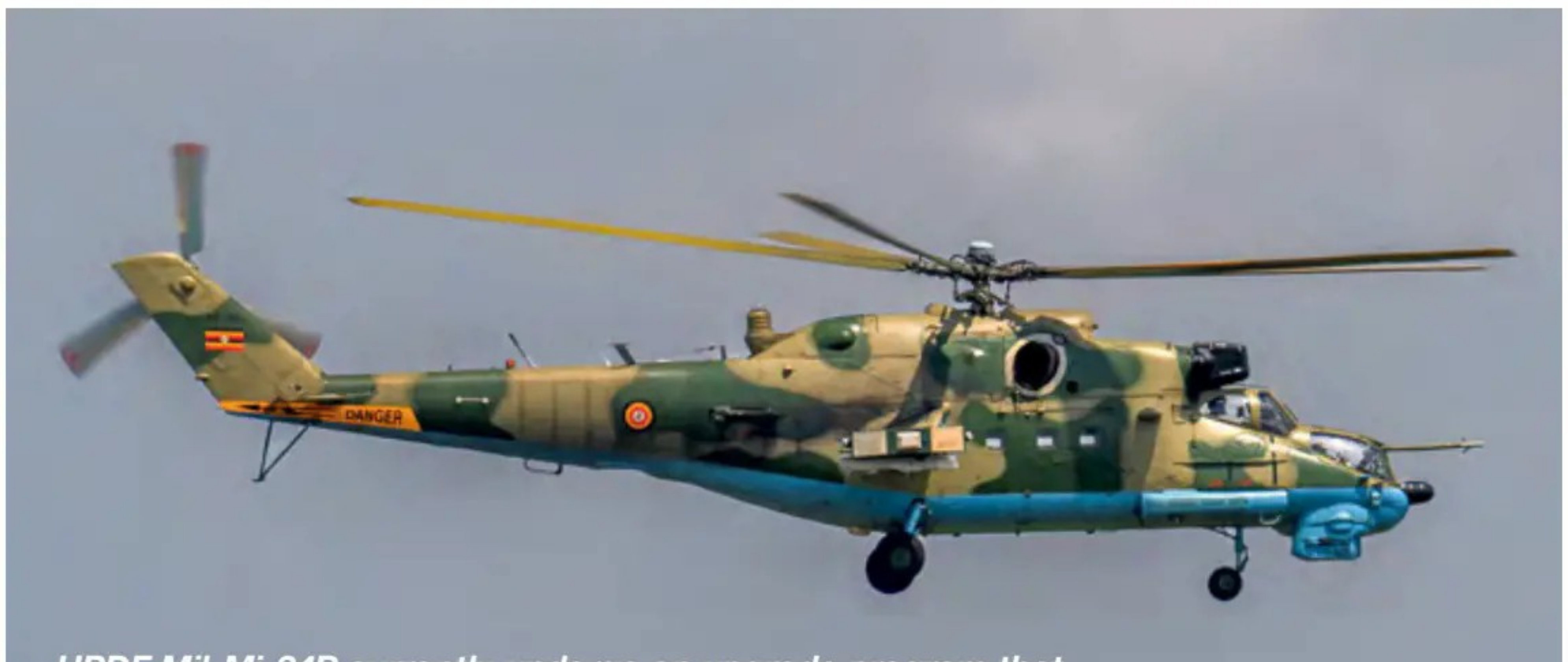
Flankers and helicopters

UAF's main fighter force comprises a small fleet of five Sukhoi Su-30MK2 *Flankers*. Six were originally acquired from Russia in 2011, but one was lost in a fatal accident in 2020. All of the Sukhois are based at Entebbe Air Force Base, but any other information about the fleet's current status is very sparse and movements are rare. Some jets can regularly be seen parked outside their hangars with their canopies and engines covered up, but it is not possible to deduce more about their current operational status and capabilities.

In contrast, more public information is available about the UAF helicopter fleet, as the rotary assets are far more active and can be regularly seen operating out of the eastern part of Entebbe airport. The inventory of the UPDFAF lists a large number of helicopter types, including several Bell models like the Bell 206 or UH-1H Huey, Russian-built Mil Mi-24 and Mi-28 attack helicopters and different versions of the most numerous model in the fleet, the Mi-17.

Out of this diverse fleet, the Mi-17 *Hips* and Mi-24 *Hinds* could be seen flying at Entebbe. Uganda's Mi-24P are particularly interesting, as they are undergoing a local upgrade program. Externally, the most visible modifications are the installation of new sand filters, and sensors for the helicopter's self-defence system, that are likely to be part of an improved avionics system. The first of these upgraded airframes was accepted by Ugandan President Yoweri Museveni in April 2023.

Work on the helicopters is performed at a new maintenance, repair and overhaul (MRO) plant established at the Nakasongola Air Force Base, some 95 miles (150km) north of Entebbe. The MRO has been created in partnership with Russian company Pro-Heli International, aimed at serving the entire African helicopter MRO market, including those of the United Nations (UN) helicopters. Since then, no more news has appeared on this program, but it can be assumed the whole fleet of Ugandan Mi-24P *Hinds* will receive attention.



UPDF Mil-Mi-24P currently undergo an upgrade program that is performed in-country. They can be identified by the newly added sand filters and sensors on the stub wings for the self-defence system. AF-805 was thought to be on a maintenance flight as the canon on the starboard side was not installed. The pilot in front seat isn't wearing a helmet either

UN missions

Entebbe is also a major hub for operations around Central Africa. The base of their operations is located at the old Entebbe Airport civil terminal and control tower. This site hit international headlines in July 1976 when Israeli commandos freed hostages from Air France Flight 139, and some years later, in April 1979, it was partially destroyed during the Uganda–Tanzania War.

Nowadays the site is used for handling UN cargo operations, maintenance of their aircraft and helicopters as well as performing their daily flight operations. For years the focus of UN missions was Mali, South Sudan, the Democratic Republic of Congo and Sudan's Darfur region.

In recent times the United Nations Organization Stabilization Mission in the Democratic Republic of Congo (MONUSCO), as well as the United Nations Mission in South Sudan (UNMISS), is calling upon most of the resources. This is reflected by several daily flights of UN passenger aircraft heading to Juba, the capital of South Sudan, as well as cargo flights to support the World Food Programme (WFP) to the very same airport. Their supply and food assistance is then distributed in South Sudan by the United Nations Humanitarian Air Service's smaller aircraft and helicopters. The current pace and use of material by the UN in recent years is evidenced in the derelict airframes stored around the airport, including a dozen Mi-8, Mi-17s, HS-748s and even an engineless L-100 Hercules. Other airframes have been cannibalised for spare parts and have long since gone.

Uganda's fast jet fleet consists of five Sukhoi Su-30MK2s, among them AF-011, which seems to be an active example

Su-30MK2 AF-031 had a more faded appearance and has obviously sat in the sun for a long while. The current status of the Flanker fleet is unclear

ER-MYC
UR-AYR

Mil Mi-8 and Mi-17 are the backbone for UN supply flights within the area of operations. The rough African environment takes its toll on the helicopters and many used airframes are stored at Entebbe to be used for spare parts

5X-QBR
AF-617
AF-621
J1 J3 →

Two main versions of the Mil Mi-17 Hip are used by the UPDF and are equipped either as a transport helicopter like Mi-17V-5 (AF-621) or fitted with additional stores for ground attack missions like Mi-171E AF-617

Shy VPAF on show… briefly

Gordon Arthur attended the Vietnam International Defence Expo held at Hanoi's Gia Lam Air Base from December 19-22, where he had an opportunity to view the seldom-seen Vietnam People's Air Force (VPAF)

The hazy skies over Hanoi, the capital of Vietnam, briefly cleared on the morning of December 19, 2024, as the Vietnam International Defence Expo (VIDEX) celebrated its opening day. For the occasion, aircraft of the Vietnam People's Air Force (VPAF) soared above Gia Lam Air Base near the heart of the bustling city of 8.6 million inhabitants.

The aerial display occurred only on the opening day in front of invited dignitaries and involved a procession of seven Mil Mi-8/Mi-17/Mi-171 *Hip* helicopters bearing fluttering underslung flags, and eight of the VPAF's premier fighters, the Sukhoi Su-30MK2Vs.

Russia is Vietnam's traditional benefactor in terms of military equipment and, after subtracting attritional losses, the fighter fleet currently relies on 11 Su-27SK/UBK and 35 Su-30MK2V aircraft. With Vietnamese military aircraft rarely venturing beyond their national borders, this flypast was the best opportunity to see the country's fighters performing in the sky. However, photographers and the airplane-spotter community had to vie with thousands of eager spectators at the best vantage points near Gia Lam Air Base!

Inside the VIDEX 2024 venue – an air base that normally hosts C295M, M28, An-2 and C212-400-MPA aircraft of the 918th Air Transport Regiment – the VPAF was vastly overshadowed by the extensive display of equipment from the Vietnam People's Army. Nonetheless, the VPAF did show off a single Airbus C295M medium transport aircraft in the static display.

Perhaps of greater interest was the presence of the US Air Force (USAF), the only foreign air force to put in an appearance at VIDEX 2024.

Above: ***An Su-30MK2V peels away from a four-ship formation above Hanoi. Vietnam's air force presently has 35 Su-30 and 11 Su-27 fighters in active service. Three of these were 8571, 8583, 8592***

Below: ***Seven helicopters carrying national or exhibition flags opened the flypast. These are Mi-17s of the VPAF's 916th Helicopter Regiment*** *All photos, Gordon Arthur, unless stated otherwise*

A pair of A-10C Thunderbolt IIs from Osan Air Base in South Korea, which started being withdrawn from the theatre in January, as well as a single C-130J Super Hercules from Yokota Air Base in Japan were on show. Apart from supporting diplomatic rapprochement between two former foes, the appearance of these aircraft indicates that the USA sees Vietnam as an ally and will be undoubtedly seeking opportunities for future sales to Vietnam.

The ageing A-10 'Warthog' might seem an unlikely export contender, but the VPAF currently operates Su-22UM3K and Su-22M4 fighter-bombers in the close support role. Factory A32 overhauled 43 Su-22 aircraft from 2019-24, but these ageing platforms are due for replacement. Hanoi will have to decide whether to continue pursuing Russian-built aircraft or turn increasingly to the West. However, the C-130J perhaps has a better chance of achieving a future deal in Vietnam as the VPAF currently operates just three C295Ms and three NC-212i light transports, procured from Indonesia. There is thus a significant capability

Two Su-30MK2V fighters fly past. The one on the left (8583) is from the 927th Fighter Regiment; the aircraft on the right (8571) belongs to the 923rd Fighter-Bomber Regiment

An Su-30MK2V trio, 8535, 8584 and 8589, perform an aerobatic display. Two are from the 927th Fighter Regiment, while the one bottom-right is from the 935th Fighter-Bomber Regiment

gap in terms of transport aircraft in the VPAF.

The VPAF is much better equipped in terms of trainer aircraft. After ordering a dozen Yak-130 jets in 2019, the first aircraft arrived in November 2021. Operated by the 940th Regiment stationed at Phu-Cat, they are used as both lead-in fighter trainers and light ground attack aircraft. One Yak-130 crashed in November 2024, reducing the fleet to 11.

Vietnam also flies 24 older L-39C Albatros jet trainers built by Czech firm Aero Vodochody, and is in the process of replacing them with 12 new L-39NG jets contracted in February 2021. The VPAF was the L-39NG launch customer, six had reached Vietnamese shores by August 2024, and the remaining six should be in-country now. These intermediate jet trainers are assigned to the 1st Squadron of the 910th Air Training Regiment located at Dong Tac Air Base. Victor Sotona, Aero Vodochody's CEO and chairman of the board, said: "I'm extremely pleased that the final assembly and flight of the six L-39NGs went well, and our aircraft can now fully serve as a training platform for fighter pilots, as well as a tactical platform fulfilling a wide range of missions for the Vietnamese air force."

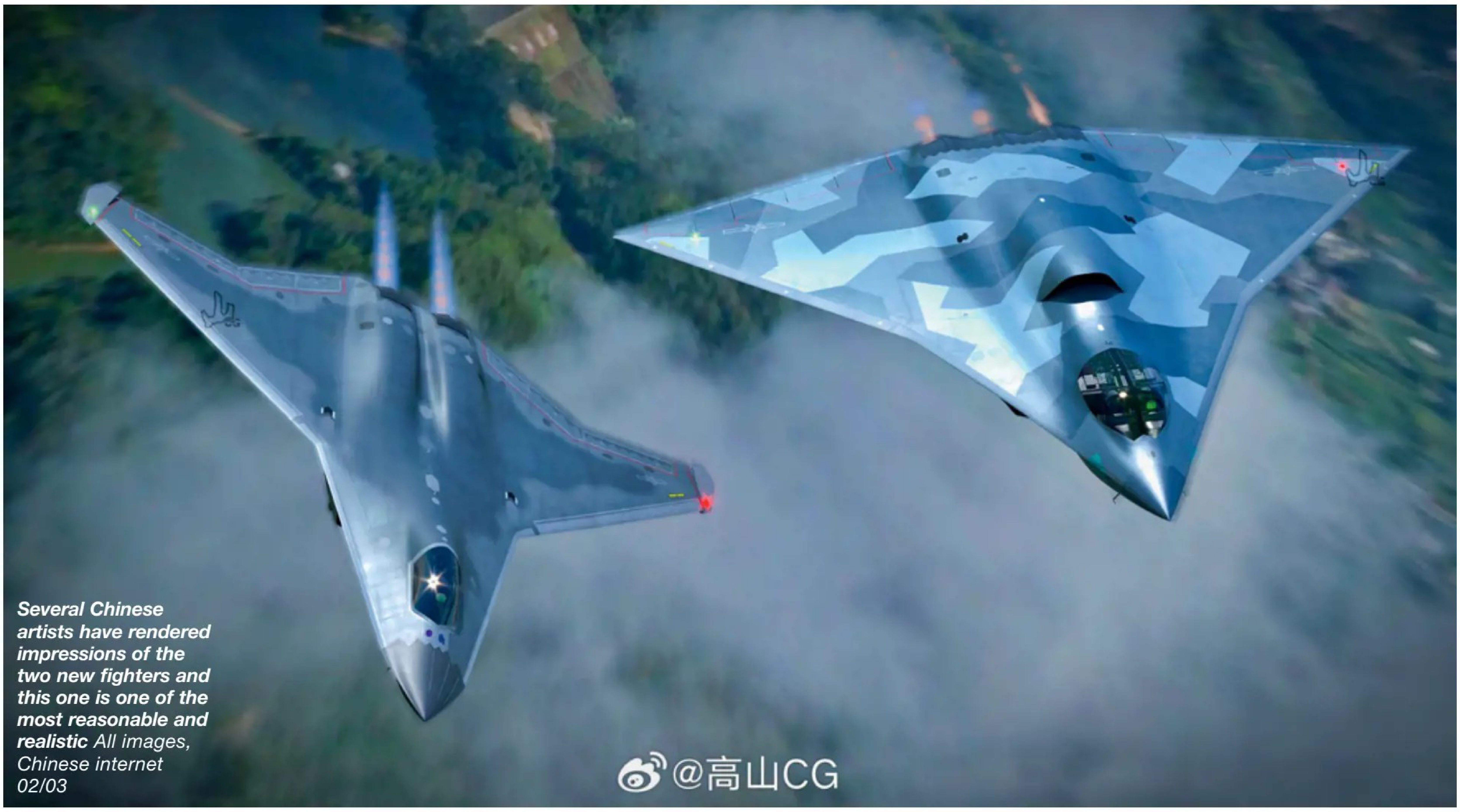
The Southeast Asian nation's trainer fleet has also been boosted by new Beechcraft T-6C Texan II aircraft from the USA. This deal for 12 T-6Cs, whose pathway was paved by the USA lifting a weapon sales ban in 2016, is very significant. It is the largest American defence deal with Vietnam since their bloody war ended in 1975. The deal was forged through the foreign military sales apparatus, and Textron Aviation Defense was awarded four contracts for three aircraft each. Under a building partnership capacity programme, the first contract was announced on August 12, 2022, the second on August 30, 2023, the third on September 29, 2023, and the last on May 31, 2024. Cumulatively, these contracts were worth US$137.65 million to Textron.

Chuck Gummow, Asia-Pacific regional director for new aircraft sales at Textron Aviation Defense, confirmed to *AirForces Monthly* that five T-6Cs were delivered to Vietnam in 2024, and that the remaining seven should be handed over in a couple of batches later this year. This will occur after the Northern Hemisphere winter passes, because single-engine T-6Cs can only cross the Atlantic on their ferry flights in good weather. Vietnam also procured one flight simulator with its original order.

The new T-6Cs are assigned to the 920th Training Regiment at Phan Thiet Air Base, progressively replacing elderly Yak-52 trainers. Gummow believes the prospect of additional T-6C sales to Vietnam is realistic, too. Unfortunately, the VPAF did not exhibit any of its new Texan IIs at VIDEX 2024.

This was just the second iteration of VIDEX, and the biennial show should next occur at the same location in late 2026. **afm**

andover ceremony for the first T-6C Texan II trainers delivered to the Vietnam People's Air Force took place on November 20, 2024 *US Embassy in Vietnam*



Several Chinese artists have rendered impressions of the two new fighters and this one is one of the most reasonable and realistic *All images, Chinese internet 02/03*

China unveils next-gen aircraft

Two more advanced Chinese warplanes were revealed in December 2024, but were they fighters or bombers? **Andreas Rupprecht** analyses the evidence

China has once again defied expectations by unveiling not one, but two next-generation fighter prototypes, mirroring the surprise introduction of the Chengdu J-20 in 2011. While many analysts and military officials predicted that a Chinese counterpart to the US New Generation Air Defense (NGAD) programme would take years to surface, China has made significant advances with two distinct prototypes from Chengdu Aerospace Corporation (CAC) and Shenyang Aircraft Corporation (SAC). This marks a major milestone in China's military aviation development, reflecting a unique vision for future aerial combat.

CAC's J-36: a revolutionary design

The first of the new fighters, the CAC J-36, made its maiden flight on December 26, 2023. Leaked images and videos revealed a black, tailless, delta-shaped aircraft with a highly swept flying wing configuration. The design is particularly distinctive due to its three-engine design, fed by two prominent variable caret intakes on either side and a third dorsal DSI intake behind the cockpit. This unique configuration sparked speculation about its intended role and performance.

Rumours about the J-36's development surfaced as early as 2018, with satellite images in 2021 hinting of the existence of a sub-scale demonstrator. However, the new aircraft is different and significantly larger

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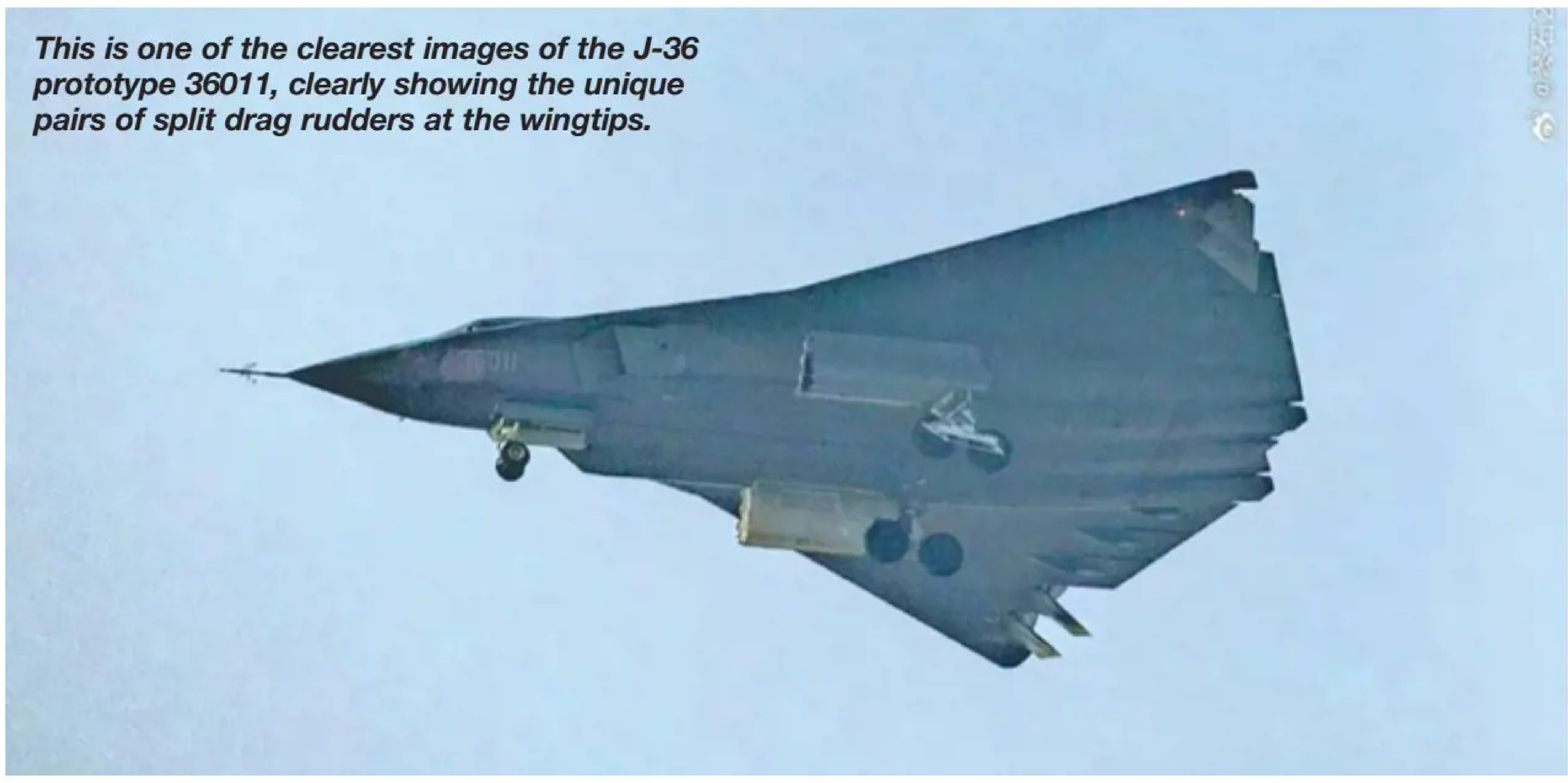
Above and Right: ***Unfortunately, only a handful of small and blurry images of SAC's new fighter are available, but it appears to be a heavy tailless fighter similar in size to a J-16*** than the J-20, estimated at around 22-24 metres in length and with a similar wingspan, with a weight exceeding 50 tonnes. It features an advanced avionics suite, including an active electronically scanned array (AESA) radar, electro-optical targeting systems (EOTS) and hexagonal side-looking conformal antennas. The aircraft's large internal volume suggests a substantial fuel capacity and weapons bay, capable of carrying PL-17 VLRAAMs, PL-15/-16, and PL-10 air-to-air missiles.

The J-36's three-engine design is one of its most debated aspects. Some analysts believe the additional engine is meant to generate sufficient electrical power for advanced radar and avionics, rather than simply enhancing speed. Others suggest that the aircraft's configuration is optimised for a combination of high-speed operations and sustained endurance. The aircraft is expected to supercruise at high speeds and reach a maximum of more than Mach 2. Reports indicate the use of WS-15 turbofan engines, with possible thrust vectoring for enhanced maneuverability and a variable cycle engine at a later date.

In terms of aerodynamics, the J-36's control surfaces are interesting. They feature six actuator control flaps and four pairs of split drag rudders at the wingtips, in addition to large landing gear doors to enhance stability at low speeds during landing. The trailing edges of the wings are believed to incorporate flexible control surfaces to assist with high-speed flight stability and agility. Additionally, its infrared signature appears to be minimised by shielding the engine exhaust under the trailing edge, a design reminiscent of the Northrop YF-23.

The role of the J-36 remains a topic of discussion. While some Western analysts suggest it might be a bomber, Chinese sources describe it as an advanced fighter designed for air dominance beyond the first island chain. It is expected to engage other stealth aircraft and loyal-wingman UAVs to conduct deep-penetration strikes. As part of China's broader air superiority strategy, it would likely complement the J-20A and later J-20S, offering extended command and networking capabilities. Some Chinese experts have even labeled it an 'airborne cruiser' due to its multi-role capability and long-range operational profile.



This is one of the clearest images of the J-36 prototype 36011, clearly showing the unique pairs of split drag rudders at the wingtips.

SAC's mystery fighter

Shortly before the J-36's unveiling, blurry images suggested that SAC had also test-flown its own sixth-generation fighter. Initially dismissed as fake, clearer imagery and video clips posted on December 26, 2024, confirmed its existence. Unlike the J-36, SAC's aircraft remains shrouded in mystery, with uncertainty over whether it is manned, unmanned or optionally piloted.

SAC has long been associated with stealth fighter-bomber concepts like the JH-XX, dating back to the 2000s. Some speculate this new fighter could be an evolution of those designs. The aircraft features a lambda-wing configuration without vertical or horizontal stabilisers and a pair of V-shaped DSI engine intakes extending to the engine nozzles. Reports suggest it is powered by two WS-15 engines with thrust vector control.

Compared to the J-36, SAC's fighter appears to emphasise maneuverability over range and payload. Its tailless design suggests a high level of stealth optimisation, with all-moving surfaces and leading-edge extensions that could improve agility. The aircraft likely features a sophisticated sensor suite with advanced networking capabilities, allowing it to act as a command-and-control node for drone swarms and other aerial assets. Some reports indicate it may also be a contender for a carrier-based stealth fighter, potentially complementing the smaller J-35 on China's future carriers.

Strategic and technological implications

The unveiling of these two aircraft has sparked an intense debate. Some rate this as a sign that China is surpassing the US in military aviation, while others compare it to the Soviet MiG-25 moment that led to the development of the F-15. Critics argue that the three-engine design suggests China still lags in engine technology, while proponents highlight China's growing aerospace competence. In fact, we still don't know enough about the new aircraft to reach confident conclusions.

The strategic implications of these developments are profound. Both fighters indicate a shift toward a network-centric warfare model, where manned fighters act as command nodes for autonomous drones and other supporting assets. This aligns with global trends in next-generation air combat, where information dominance and multi-platform co-ordination are as crucial as raw flight performance.

Yang Wei, chief designer of the J-20, suggests that the new aircraft are designed to penetrate heavily defended airspace, guide drone swarms and engage high-value targets at extended ranges. As such, the J-36 and SAC fighter represent a distinct Chinese approach to future aerial warfare, diverging from Western concepts. And China's ability to develop two complementing next-generation designs suggests significant industrial and technological maturity, further reinforcing its position as a leading military power.

One key takeaway is the clear distinction between China's approach and that of the US. While America has focused on its NGAD programme with a single winner expected, China appears to be pursuing multiple parallel designs to maximise capability and strategic flexibility. The public unveiling of these fighters could also be a political statement, signalling China's increasing confidence in its military-industrial base.

Looking ahead

As the development of these aircraft progresses, several key questions remain. Will both prototypes enter service or will one be favoured over the other? How will they compare to Western sixth-generation aircraft in terms of performance and capability? Will China integrate these platforms into a broader strategy of unmanned warfare and AI-assisted combat operations? And, finally, when will all this happen?

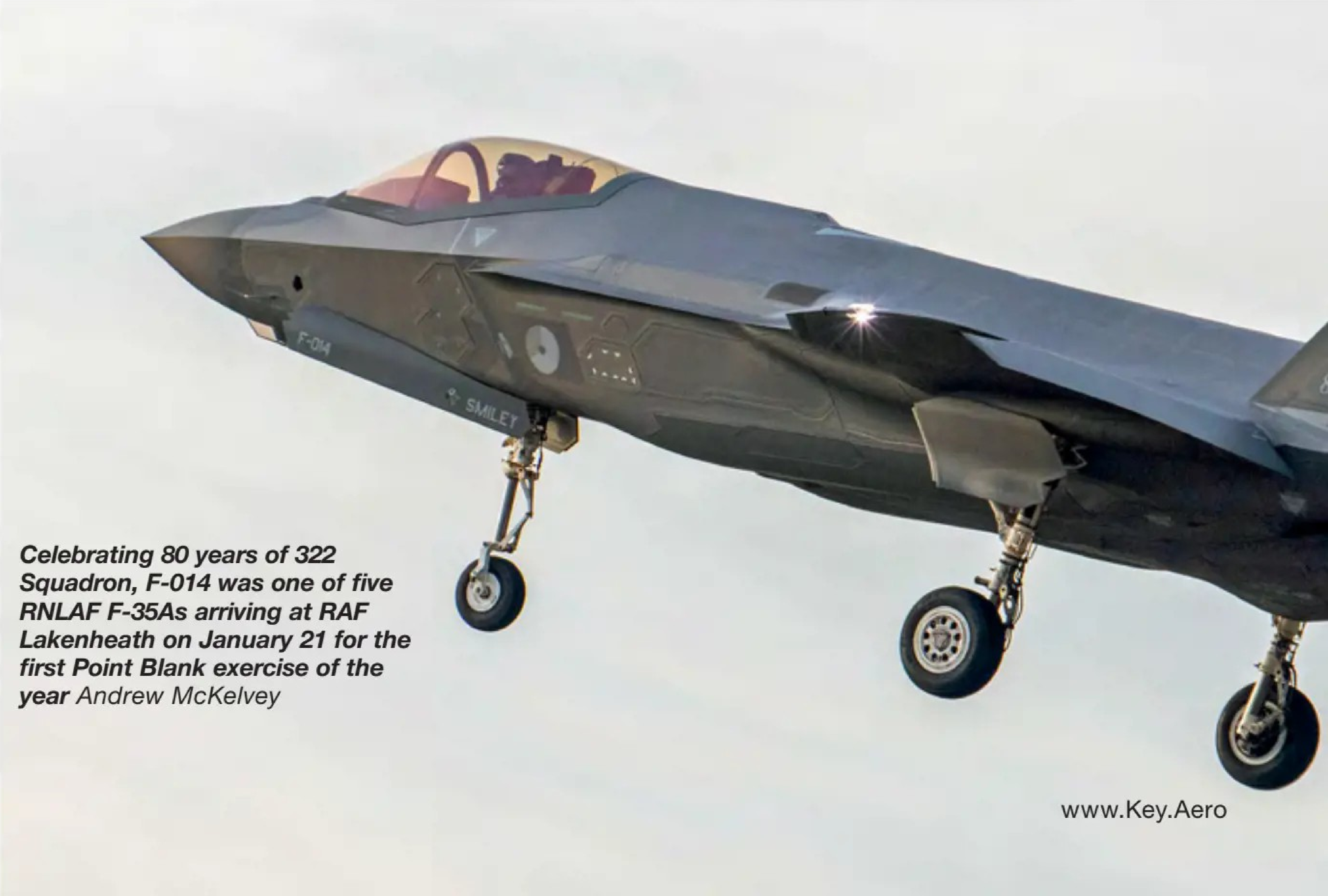
What is clear is that China is no longer merely catching up with Western aerospace technology, it is actively shaping the future of air combat. The introduction of these two fighters marks a significant evolution in China's strategic posture, with far-reaching implications for regional security and future conflicts in the Indo-Pacific. With additional test flights and more detailed images expected in the coming months, the world will be watching closely as China's vision of next-generation aerial warfare unfolds.

Just Passing Through

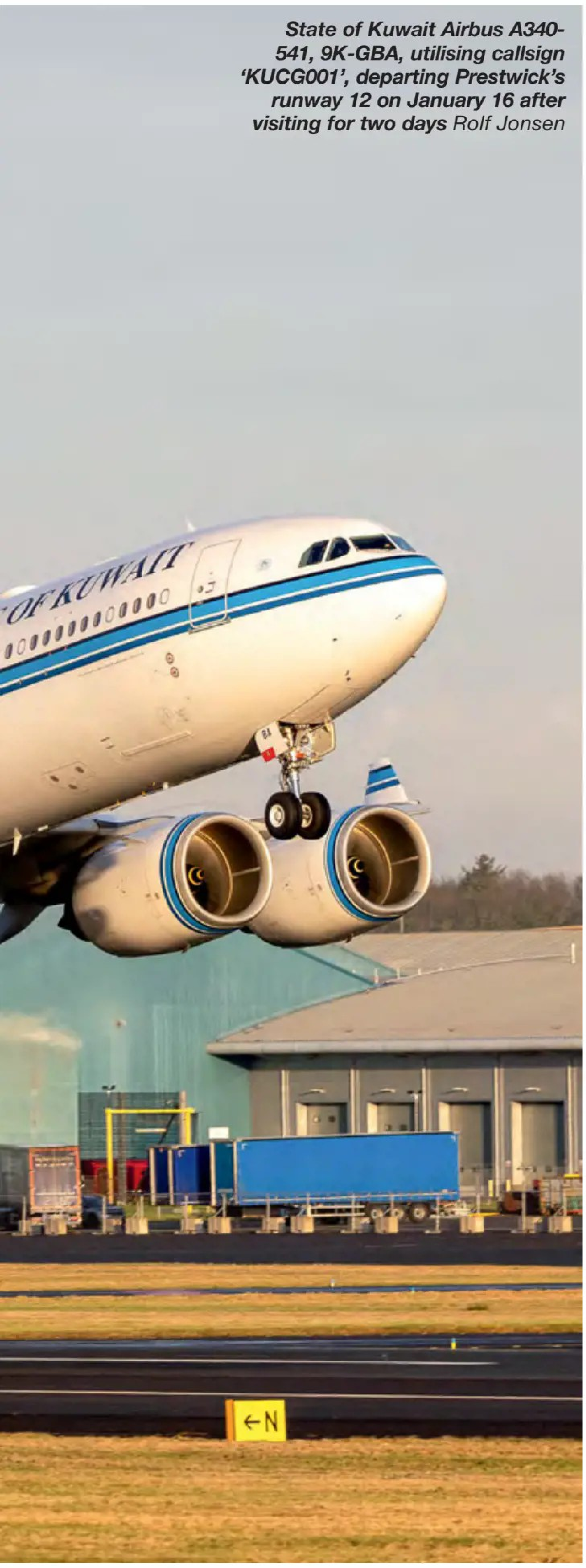
Ben Stanley Hall showcases the rich diversity of aircraft movements up and down the UK

This month's selection of interesting aircraft movements is evenly split between England and Scotland, with aircraft ranging from the mighty Boeing 747 down to a Super Puma helicopter. Four European nations are represented – France, Romania, Germany and the Netherlands – along with two gulf states, Bahrain and Kuwait.

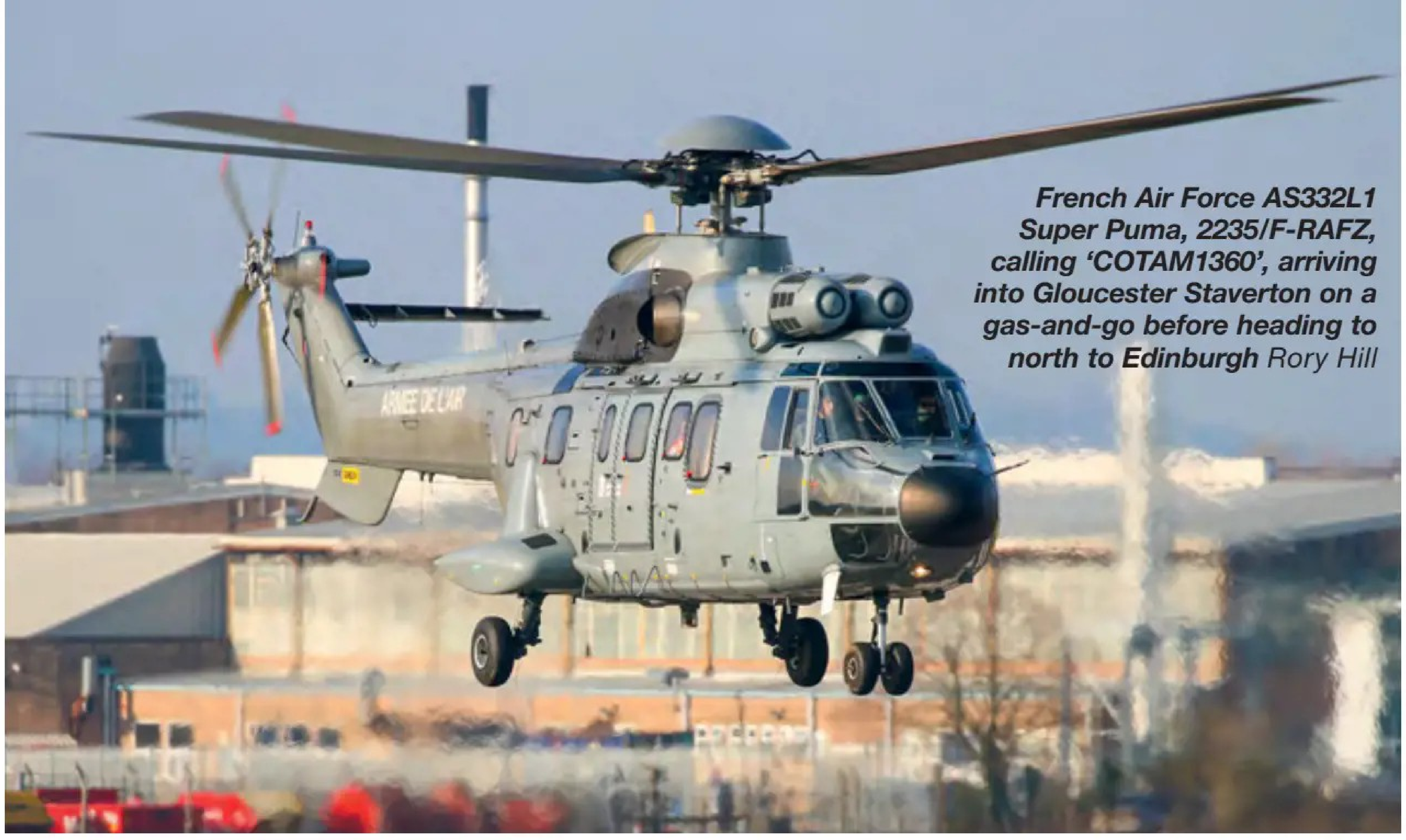
We welcome contributions from readers across the world. If you photograph an aircraft that is not in its usual location or could be of interest, please email your images, without watermarks, to ben.hall@keypublishing.com using the subject heading '*Just Passing Through*', with a short caption including as much information as possible. **afm**



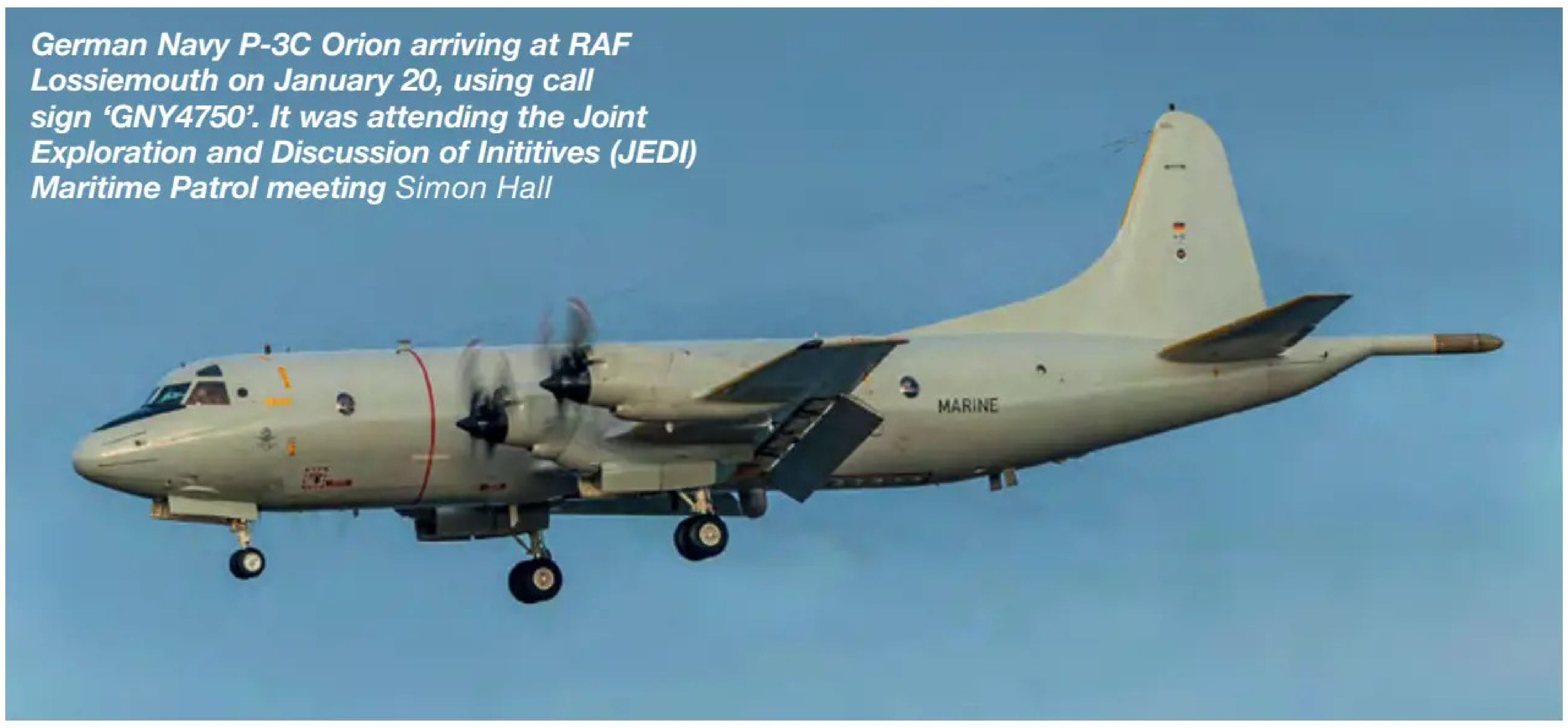
Celebrating 80 years of 322 Squadron, F-014 was one of five RNLAF F-35As arriving at RAF Lakenheath on January 21 for the first Point Blank exercise of the year *Andrew McKelvey*



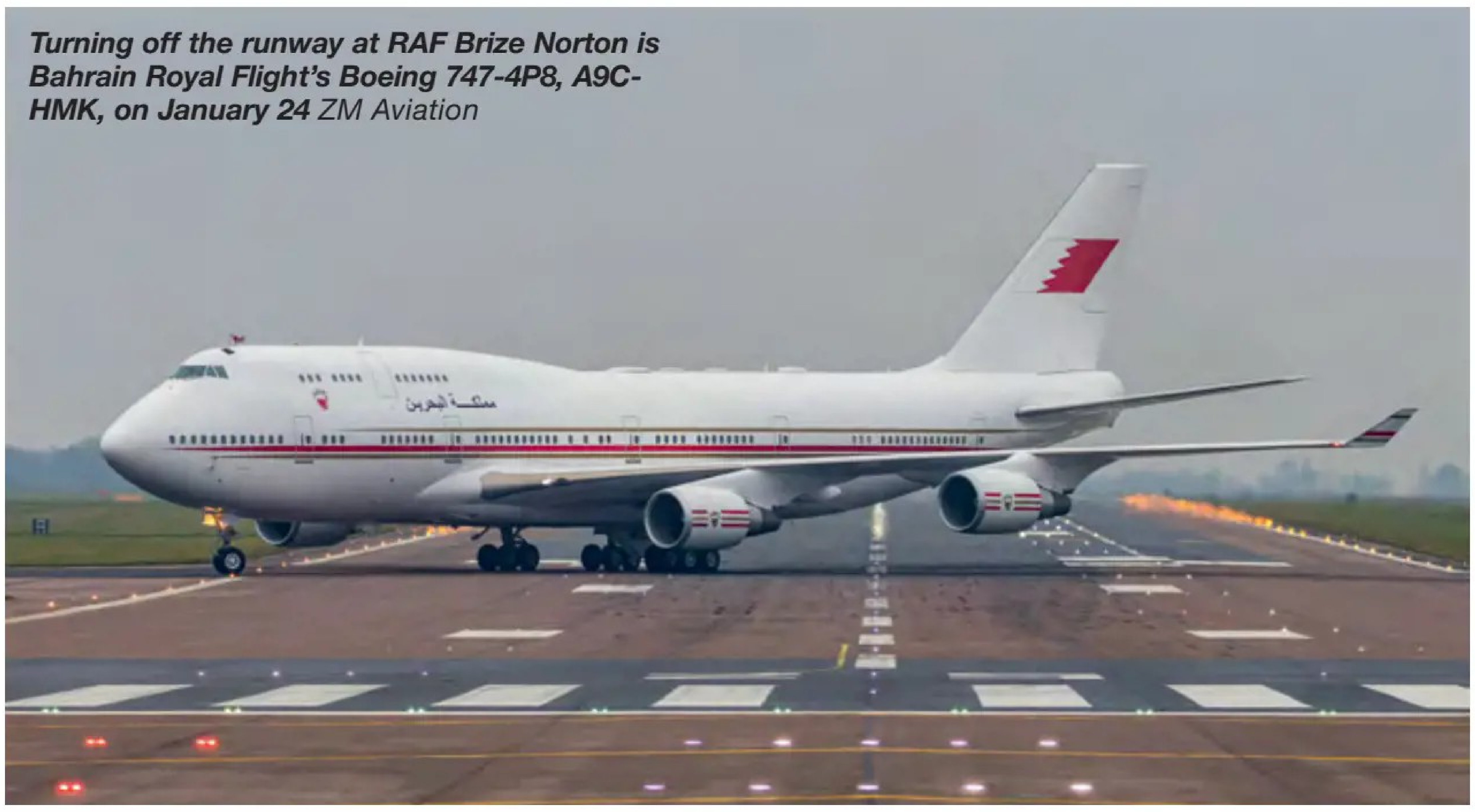
State of Kuwait Airbus A340-541, 9K-GBA, utilising callsign 'KUCG001', departing Prestwick's runway 12 on January 16 after visiting for two days *Rolf Jonsen*



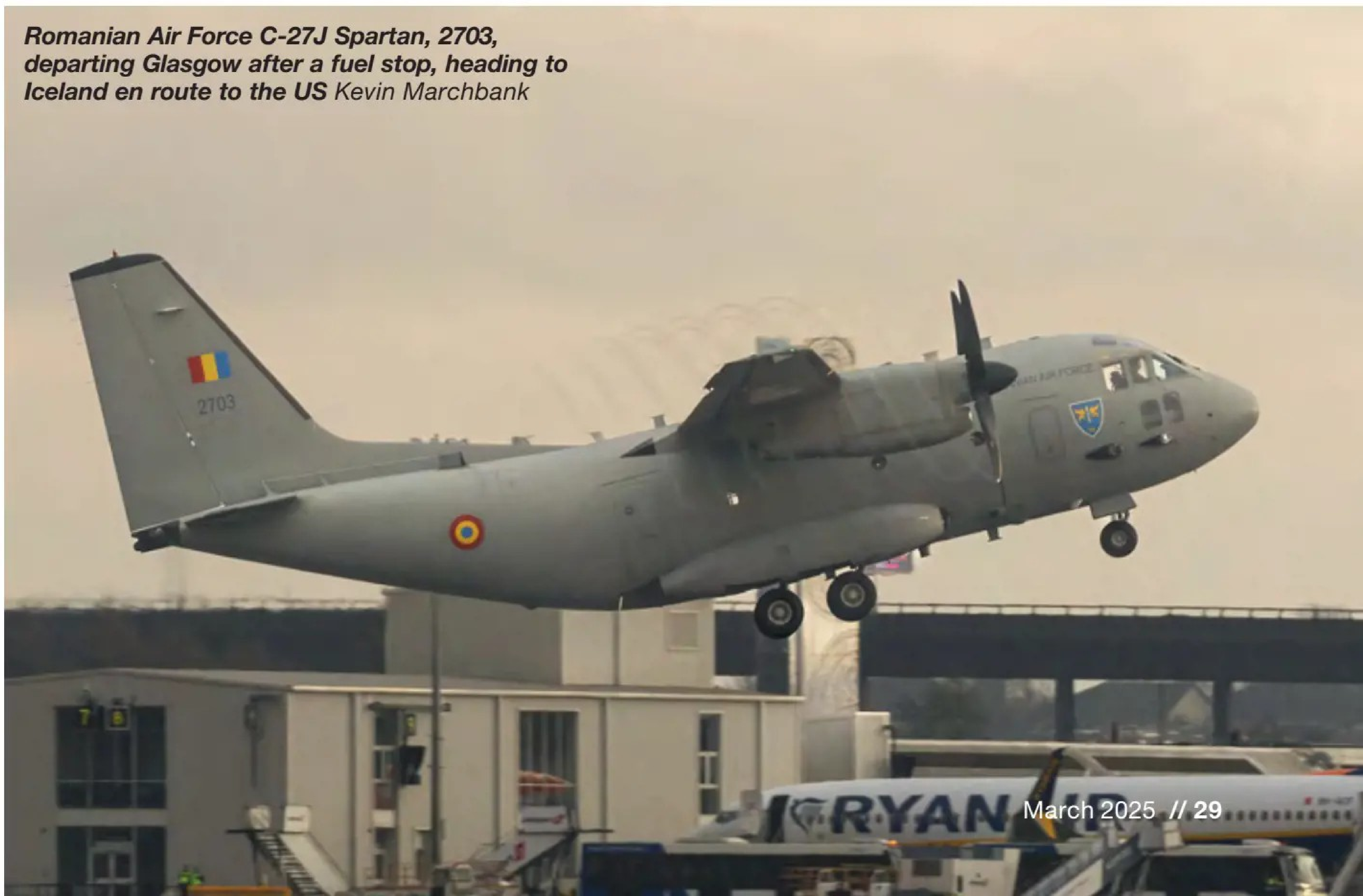
French Air Force AS332L1 Super Puma, 2235/F-RAFZ, calling 'COTAM1360', arriving into Gloucester Staverton on a gas-and-go before heading to north to Edinburgh *Rory Hill*



German Navy P-3C Orion arriving at RAF Lossiemouth on January 20, using call sign 'GNY4750'. It was attending the Joint Exploration and Discussion of Inititives (JEDI) Maritime Patrol meeting *Simon Hall*



Turning off the runway at RAF Brize Norton is Bahrain Royal Flight's Boeing 747-4P8, A9C-HMK, on January 24 *ZM Aviation*



Romanian Air Force C-27J Spartan, 2703, departing Glasgow after a fuel stop, heading to Iceland en route to the US *Kevin Marchbank*

Calling for Carriers!

As HMS *Prince of Wales* (R09) and the wider UK Carrier Strike Group prepares to embark on its highly anticipated CSG-25 deployment to the Indo-Pacific later this year, **Khalem Chapman** looks back on the UK's naval renaissance and provides an operational overview on the Royal Navy's latest 'flattops'

As the largest and most powerful warships to have ever entered fleet service with the Royal Navy, the UK's two new, Queen Elizabeth-class aircraft carriers – HMS *Queen Elizabeth* (R08) and her sister warship, HMS *Prince of Wales* (R09) – formed the alluring centrepiece of Britain's much-needed naval renaissance when they were formally commissioned in 2017 and 2019, respectively.

Their arrival beckoned the rebirth of the Navy's Carrier Strike capabilities, bringing with them a host of new, cutting-edge aircraft to form one of the most advanced carrier air wings (CVW) in the world.

From December 2010, Britain rapidly lost its ability to effectively project carrier-based combat airpower as a result of the highly controversial 2010 Strategic Defence and Security Review (SDSR). The UK's Carrier Strike community suffered significant losses, with the Joint Force Harrier fleet being axed on December 15, 2010. The first of the Navy's two remaining Invincible-class aircraft carriers, HMS *Ark Royal* (R07), was decommissioned on March 11, 2011, followed by HMS *Invincible* (R06), having been retained as a helicopter carrier, on August 28, 2014.

As the UK's older Carrier Strike assets were pushed into an early retirement, construction

of the first Queen Elizabeth-class 'flattop' was starting to progress at the Rosyth Dockyard in Fife, Scotland. With the first steel being cut for the project on July 7, 2009, the warship was christened HMS *Queen Elizabeth* (*QE*) on July 4, 2014, before being formally launched on July 17. After a period of sea trials, *QE* was commissioned into service at HM Naval Base Portsmouth, Hampshire, on December 7, 2017, plugging the three-year capability gap caused by the withdrawal of *Invincible* in 2014.

Construction of the second Queen Elizabeth-class carrier got under way on May 26, 2011. The warship was formally christened HMS *Prince of Wales* (*POW*) on September 8, 2017, before being launched on December 21, that year. Following initial sea trials, *POW* was commissioned into fleet service at Portsmouth on December 10, 2019.

As the first-in-class 'flattop', *QE* conducted the majority of rotary and fixed-wing flight trials for the UK's new-generation carrier force. In a phased manner, initial helicopter trials began in early 2018, followed by fixed-wing flight testing with the F-35B off the US East Coast as part of the WESTLANT 18 and 19 deployments in late 2018 and late 2019, respectively.

On completion, the UK's renewed and highly modernised Carrier Strike capabilities were tested during *QE's* first operational deployment to the Indo-Pacific as part of Operation Fortis (or Carrier Strike Group-21, CSG-21) from May-December 2021. Having entered operational fleet service some two years after *QE*, *POW* had spent the best part of her career so far preparing for her own maiden deployment, which is scheduled to begin in April leading the UK's CSG-25 to the Indo-Pacific.

A new age

Measuring 284m (923ft) long and 73m (240ft) wide with an empty displacement of 65,000 tonnes – rising to an estimated 80,600 tonnes at full load – the new 'flattops' are the largest warships ever to lead the British fleet. Both are roughly three times the size of the previous Invincible-class carriers, which displaced 22,000 tonnes (empty).

Operationally speaking, the flight decks of both 'flattops' are far more accommodating, being 280m (919ft) long, 70m (230ft) wide and nearly twice the size of the decks carried by their predecessors. While the Invincible-class 'flattops' had a capacity for up to 22 aircraft, their successors can be surged to carry a maximum of 72, if required. Until December 2010, the UK embarked a Carrier Air Group that – depending on mission requirements – typically comprised between 12-18 Harrier GR7/GR9 fighters and four to ten Sea King ASaC7 airborne early warning (AEW) helicopters or Merlin HM1 anti-submarine/surface warfare (ASW/ASuW) rotorcraft – platforms that would now be deemed relatively obsolete by the capability standards of modern warfare.

Britain's maritime renaissance not only provided two cutting-edge 'flattops', but also a new, highly modernised CVW. Together, these fifth-generation naval assets will project UK military power/influence on the global stage for the next half-century, be it to deter potential aggressors, respond to crises or to support Westminster's diplomatic/political objectives and interests. The CVW aboard these carriers also comprises some of the most advanced aircraft to have been developed for carrier-borne operations to date.

While both warships can be surged to carry up to 72 aircraft during wartime, a routine

Left: ***An historic moment in the UK's decade-long carrier renaissance occurred on May 19, 2021, when HMS Queen Elizabeth (R08) – seen carrying a mix of F-35Bs from the RAF-badged No 617 Squadron 'The Dambusters' and USMC's VMFA-211 'Wake Island Avengers' (above) – sailed alongside her sister warship, HMS Prince of Wales (R09), for the first time*** *MOD Crown Copyright/POPhot Jay Allen*

Below: ***The UK welcomed the return of its dormant Carrier Strike capabilities on June 20, 2021, when two UKLF F-35Bs (ZM147/'013' and ZM154/'020') carried out the type's first operational mission over the Middle East in support of Operation Shader, while operating from QE during the CSG-21 cruise. British F-35Bs currently carry Paveway IV LGBs, AMRAAMs and ASRAAMs, but this arsenal will soon be expanded to include the Meteor BVRAAM and SPEAR 3 miniature cruise missile*** *MOD Crown Copyright/Cpl Lee Matthews*

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ZM153

An RAF-operated Chinook HC5 (ZH902) is trialled on the aircraft lift aboard QE in February 2018. The carrier's two aircraft lifts can raise two F-35Bs or a single Chinook (without folded blades) from the hangar to the flight deck in approximately 60 seconds MOD Crown Copyright

> **"The new CSG is the embodiment of British maritime power and sits at the heart of a modernised and emboldened Royal Navy"**
> *Cdre Steve Moorhouse, Commander of the UK CSG (2018-2022)*

peacetime cruise would typically see no more than 40 embark aboard. Both can carry a total of 36 short take-off and vertical landing (STOVL)-capable F-35B Lightnings, but only 12-24 examples of the fifth-generation multi-role fighter would deploy during peacetime (see 'Lightnings on deck').

Alongside the F-35Bs, the 'flattops' can also embark several different rotorcraft, including two distinct versions of the Merlin HM2 – with the baseline version tasked with the ASW mission and Crowsnest Airborne Surveillance and Control (ASaC) role kit-fitted examples covering the AEW role (see 'Multi-mission Merlins'). Both ships can also accommodate the 'Commando' Merlin HC4s, when required.

Each carrier is also capable of embarking both variants of the nimble Wildcat multi-mission battlefield utility helicopters, comprising the 'Commando' Wildcat AH1s and the ASW/ASuW-configured Wildcat HMA2s (see 'On the prowl'). They can also carry RAF-operated Chinook HC5 tactical transport helicopters and the Army Air Corps' (AAC) new Apache AH2 gunships, which are used to support UK Commando Helicopter Force (CHF) operations (see 'Going Commando').

Assembling the fleet

On June 26, 2017, *QE* departed Rosyth for initial sea trials. While not yet capable of conducting sustained flight operations, it did not take long for the first helicopter – a Merlin HM2 from the Fleet Air Arm's (FAA) 820 Naval Air Squadron (NAS) – to grace her newly forged flight deck on July 3.

After completing a successful period of phased flight trials from 2018 to 2020, the *QE* was advancing towards Initial Operational Capability (IOC). On September 21, 2020, it departed Portsmouth to participate in the UK-led multinational training drill, Exercise Joint Warrior 20-2 (JW 20-2), which was crucial for *QE's* upcoming IOC declaration and preparing the UK CSG for its first global deployment.

Leading from the front! QE leads the rest of CSG-21 back to the UK during the final stages of Operation Fortis on October 19, 2021 MOD Crown Copyright/LPhot Unaisi Luke

Lightnings on deck

Operated as a pooled fighting force from RAF Marham, Norfolk, the UK Lightning Force (UKLF) currently fields 31 F-35Bs across three squadrons, staffed by a mix of RAF and Fleet Air Arm (FAA) personnel. The force comprises two operational frontline units – the RAF's No 617 Squadron 'The Dambusters' and the FAA's 809 Naval Air Squadron (NAS) 'Immortals' – while the Air Force-badged No 207 Squadron serves as the Operational Conversion Unit (OCU).

As is the case with both *QE* and *POW*, the F-35B is very much in the early stages of its evolution. Currently, it can deliver a hard-hitting punch using Paveway IV LGBs against surface targets and AMRAAM/ASRAAMs against airborne threats. Facilitated by the Technology Refresh 3 (TR-3) update, the type's highly anticipated Block 4 upgrade – set to begin later this decade – will add the Meteor BVRAAM and SPEAR 3 miniature cruise missile to its growing arsenal, making it even more lethal.

While the UK remains "committed" to acquiring 138 F-35Bs in total, just 48 jets have been ordered to date. The UK has received 35 of the 48 F-35Bs ordered in its initial Tranche 1 procurement phase, although one aircraft was lost during the Fortis deployment in 2021. Another three jets were retained by No 17 Test and Evaluation Squadron (TES) at Edwards AFB, California, for ongoing test activities, but these jets will soon be sent to Marham to join the wider operational fleet.

The UKLF expects to receive its final Tranche 1 F-35Bs before declaring full operational capability (FOC) before the end of this year. A second batch of 27 aircraft is expected to be ordered in the Tranche 2 procurement phase, with the aim of growing the fleet to 74 F-35Bs by the end of this decade.

Above: ***Personnel from QE's Air Engineering Department prepare a Paveway IV LGB for an F-35B live-fire exercise on October 5, 2023. Both carriers are fitted with a Highly Mechanised Weapon Handling System (HMWHS), which uses a network of tracks and remote-controlled 'moles' to move pallets of munitions to weapon preparation areas, the hangar or flight deck via a series of hydraulic lifts that run through the heart of the warship*** *MOD Crown Copyright/LPhot Belinda Alker*

QE embarked her largest number of aircraft for JW 20-2, including eight Merlin HM2/HC4s from the FAA's 820/845 NAS and 14 F-35Bs from the UK Lightning Force (UKLF) – namely the world-famous 'Dambusters' of No 617 Squadron and the USMC's Marine Fighter Attack Squadron 211 (VMFA-211) 'Wake Island Avengers'. This marked the largest group of fifth-generation jets to be deployed at-sea and the biggest concentration of fighters to embark aboard a British carrier since the Centaur-class light carrier, HMS *Hermes* (R12), completed her last operational cruise in 1983.

JW 20-2 was the first time a full CSG was formed around the UK's new carriers, offering an early glimpse of the strike group's force posture before the Operation Fortis deployment in 2021. It also provided *QE* and her CVW with an opportunity to conduct training and integration activities alongside her escort vessels ahead of the carrier's first operational cruise.

The exercise involved several other British warships, including the Type 45 (Daring-class) air-defence destroyers, HMS *Diamond* (D34) and HMS *Defender* (D36); Type 23 (Duke-class) frigates, HMS *Kent* (F78) and HMS *Northumberland* (F238); and an unnamed nuclear submarine. The Royal Fleet Auxiliary (RFA) supplied two replenishment oilers with the presence of the Tide-class RFA *Tideforce* (A139) and Fort-class RFA *Fort Victoria* (A387). The UK CSG was also joined by the US Navy's Arleigh Burke-class guided-missile destroyer, USS *The Sullivans* (DDG-68), and the Royal Netherlands Navy's De Zeven Provinciën-class frigate, HNLMS *Evertsen* (F805).

All of these ships – except *Northumberland* and *Tideforce*, which were replaced by HMS *Richmond* (F239) and RFA *Tidespring* (A136), respectively – later joined the *QE*-led CSG-21 during Operation Fortis, along with the nuclear-powered Astute-class attack submarine, HMS *Astute* (S119).

As this new-look strike group first assembled during JW 20-2 in September 2020, Cdre Steve Moorhouse, Commander of the UK CSG, declared: "The UK's maritime renaissance has been unfolding over many years, as we introduced a new generation of ships, submarines and aircraft into service. But this marks the first time we have brought them together in a cohesive, potent fighting force. The new CSG is the embodiment of British maritime power and sits at the heart of a modernised and emboldened Royal Navy.

"Protected by a ring of advanced destroyers, frigates, helicopters and submarines, and equipped with fifth-generation fighters, [*QE*] is able to strike from the sea at a time and place of our choosing, and with our NATO allies at our side, we will be ready to fight and win in the most demanding circumstances… Carrier Strike offers Britain choice and flexibility on the global stage; it reassures our friends and allies and presents a powerful deterrent to would-be adversaries."

After completing JW 20-2, *QE* returned to Portsmouth on October 15, 2020. The Navy formally declared IOC on its new flagship on January 4, 2021. She then conducted final work-up and aircrew carrier qualification activities before leading CSG-21 to the Far East during Fortis.

Five Merlin HC4s from 845 NAS 'Junglies' and a single Wildcat AH1 from 847 NAS fly back to Yeovilton after parting ways with the UK CSG following the conclusion of the seven-month Operation Fortis (CSG-21) cruise on December 8, 2021. These aircraft are a vital part of the CHF and while they can embark aboard the carriers, they will typically operate from escort vessels during CSG deployments *MOD Crown Copyright*

Above: ***This F-35B (ZM154/'020') demonstrates the fifth-generation multi-role stealth fighter's unique STOVL configuration while preparing to land aboard POW after completing a mission as part of Exercise Nordic Response 24 on March 5, 2024*** *MOD Crown Copyright/AS1 Amber Mayall*

Below: ***The Navy has procured ten Crowsnest ASaC role kits for its Merlin HM2 fleet. At least five helicopters will be configured for AEW operations at any given time, with three 'frontline' aircraft being assigned to the high-readiness carrier and the remaining two being used for training/evaluation work at Culdrose*** *MOD Crown Copyright/AS1 Amber Mayall*

Three WAH-64D Apache AH1 gunships from No 656 Squadron – a part of the AAC's 4 Regiment at Wattisham Flying Station, Suffolk – land aboard POW to conduct integration training with the new Queen Elizabeth-class aircraft carrier in June 2021. The latest version of the gunship, the AH-64E(V6) Apache AH2, has yet to embark on the 'flattops' MOD Crown Copyright

Leading from the front

In April 2021, the CVW gathered for its first long-term operational deployment aboard *QE*. Ten F-35Bs from the USMC's VMFA-211 arrived at RAF Lakenheath, Suffolk, from April 26-28. They remained there until May 2 and the following day, eight UKLF F-35Bs – with crews drawn from 'The Dambusters' – joined their US counterparts on the carrier.

Meanwhile, 820 NAS deployed seven Merlin HM2s aboard *QE* on April 27, comprising four ASW-configured helicopters and three Crowsnest ASaC aircraft. On May 1, four Wildcat HMA2s from 815 NAS embarked on each of *QE*'s escort vessels (*Diamond*, *Defender*, *Kent* and *Richmond*), while three Merlin HC4s from 845 NAS arrived aboard *Fort Victoria* on May 3.

Before departing for the Far East, CSG-21 participated in Exercise Strike Warrior 21-1 (SW 21-1) – the maritime element of the UK-led Exercise Joint Warrior 21-1 – off the Scottish coast from May 8-19. The training drill involved around 13,400 personnel, 150 aircraft, 31 warships and three submarines from ten different NATO nations. It marked the first deployment of the Crowsnest-equipped Merlins and UKLF F-35Bs – equipped with Advanced Short-Range Air-to-Air Missiles (ASRAAMs) – conducting the first fast-jet live-fire operations from a British carrier at sea in 15 years.

After completing SW 21-1, the CSG returned to port to embark fuel and stores for the Fortis cruise. While transiting back to Portsmouth on May 19, *QE* met up with her sister ship, *POW* – which was conducting Fleet Operational Sea Training (FOST) in UK waters - marking the first time they had sailed together. After briefly visiting home, *QE* departed Portsmouth on May 22 to begin her first operational deployment.

Led by *QE*, CSG-21 began its Fortis cruise by participating in two large-scale drills, including the latter stages of the NATO-led Exercise Steadfast Defender 21, which was held off the coast of Portugal from May 20-28. Meanwhile, the F-35Bs took part in the French-led Exercise Atlantic Trident 21 alongside other fighters from the RAF, USAF and French Air and Space Force. Held from May 17-28, the drill aimed to improve the air combat readiness of the three participating nations, while enhancing overall integration at the operational and tactical level. CSG-21 subsequently conducted exercises alongside regional NATO allies in the Mediterranean, including the French Navy's flagship 'flattop', FS *Charles de Gaulle* (R91), during Exercise Gallic Strike 21, a joint training drill held from June 1-3.

The UK cemented the return of its Carrier Strike capabilities on June 20, when 'The Dambusters' conducted the UKLF's first operational strike mission from *QE*. Launched alongside the USMC's F-35Bs, the strikes were carried out in support of Operation Shader – Britain's contribution to wider coalition efforts to defeat ISIS forces in Iraq and Syria. This mission took place almost a decade after the UK's last maritime strike operations over Libya as part of Operation Ellamy in 2011.

After the mission, Cdre Moorhouse said: "To date, we have delivered diplomatic influence on behalf of the UK through a series of exercises and engagements with our partners, now we are ready to deliver the hard punch of maritime-based airpower against a shared enemy."

He said the involvement of *QE* and her air wing in this campaign also "sends a wider message" and continued: "It demonstrates the speed and agility with which a UK-led [CSG] can inject fifth-generation combat power into any operation, anywhere in the world, thereby offering the British government, and our allies, true military and political choice."

Just days after CSG-21 transited through the Suez Canal into the Red Sea on July 6, the

> ***"The success of this trial heralds a new dawn in how we conduct maritime aviation and is another exciting step in the evolution of the Royal Navy's [CSG] into a mixed crewed and uncrewed fighting force"***
> *Rear Adm James Parkin, the Royal Navy's Director Develop*

Multi-mission Merlins

Headquartered at RNAS Culdrose, Cornwall, the Merlin HM2-equipped 820 NAS is responsible for detecting/countering airborne and subsurface threats while deployed with the Carrier Strike Group. For any deployment, the HM2 forms the backbone of rotary-wing operations from the carriers.

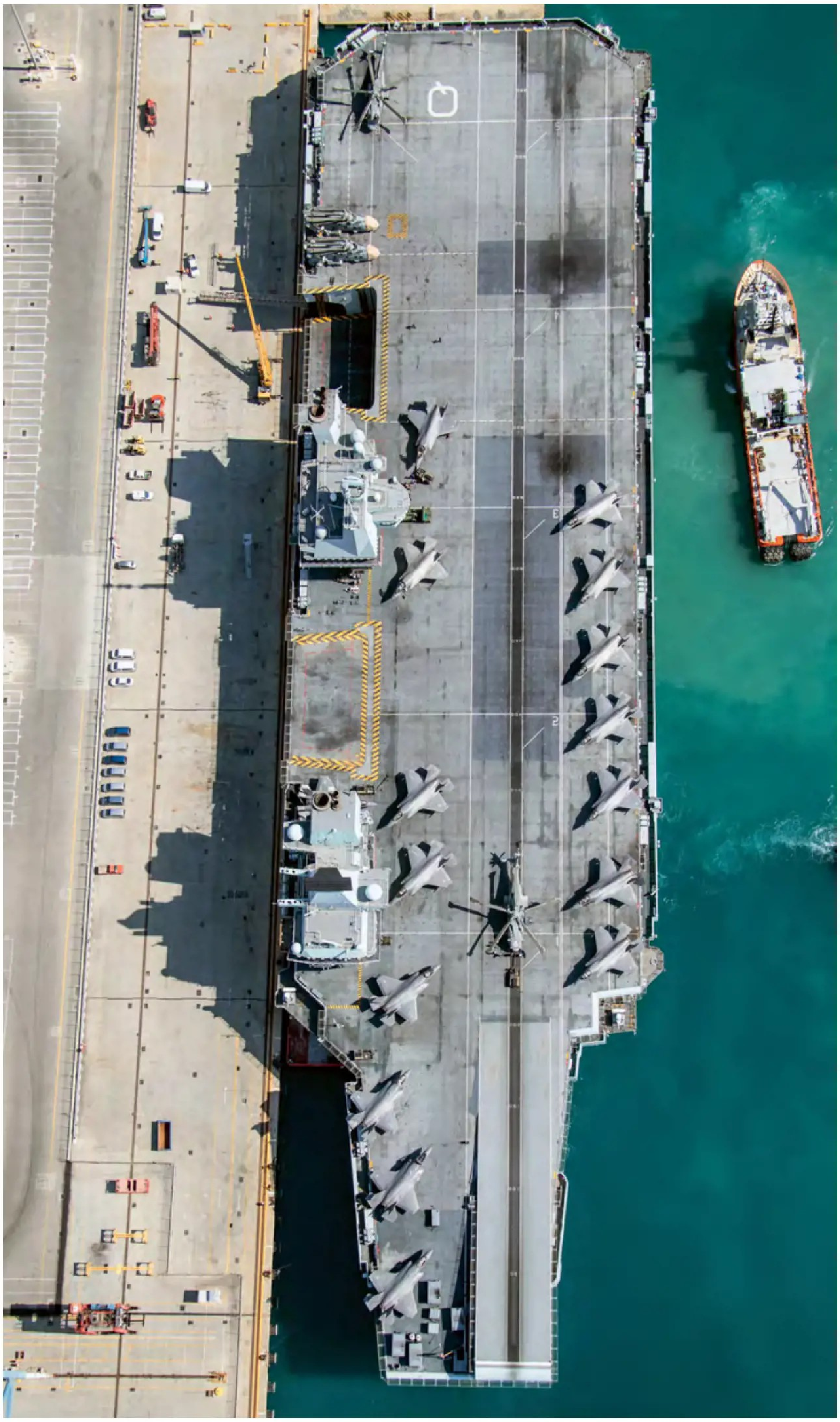
Powered by three RTM322 turboshaft engines, the HM2 is equipped with a Selex Galileo Blue Kestrel 5000 maritime surveillance radar and a Folding Light Acoustic System for Helicopters (FLASH) dipping sonar. It can be armed with a mix of Sting Ray acoustic-homing lightweight torpedoes, Mk11 depth charges and a Browning M3M .50-cal machine gun. While primarily used for ASW operations, HM2s can also support search-and-rescue (SAR), casualty evacuation, humanitarian assistance/disaster response (HA/DR), maritime patrol and interdiction missions.

Several Merlin HM2s have been equipped with the Crowsnest ASaC role kit to meet the airborne early warning (AEW) requirements of the UK's new carrier air wing (CVW). A Crowsnest-fitted HM2 is equipped with a Searchwater 2000 radar, providing an early warning of both air/surface threats. The system is housed in an inflatable kevlar bag attached to an arm on the port side of the aircraft's fuselage that is lowered into a vertical position when in use. Two Navy observers utilise the Cerberus tactical sensor suite in the helicopter's cabin to interpret the radar picture and co-ordinate other aircraft during operations.

Crowsnest is a crucial part of the CVW's operational architecture, though it faced several issues during its transition into frontline use. Having been rushed into service to support CSG-21 during Operation Fortis, the system fell below operational expectations and its performance was heavily scrutinised due to instability with the initial System Release 11 software.

To address these issues, improved System Release 11.4 software was delivered to 820 in April 2022, with the update being applied to the ASaC Mission Trainer at Culdrose and on two Merlins deployed with HMS *Prince of Wales* (R09) in May/June, that year. In mid-2022, 820 NAS began flight testing with the new System Release 12 software, which featured better overland surveillance capabilities, an improved ability to communicate with the F-35Bs and new radar modes.

The Navy eventually declared IOC with Crowsnest in July 2023, before deploying the "most advanced version" of the ASaC system on HMS *Queen Elizabeth* (R08) in September that year. CSG-25 will serve as the most significant test for the platform to date, especially as it seeks to attain Full Operational Capability (FOC). Despite this, the UK aims to replace the system with an uncrewed aircraft by 2030, but a seven-year timeframe for this feels optimistic when considering the problems faced during Crowsnest's development.



Left: ***This bird's eye view of QE while conducting a port visit to Limassol, Cyprus, on June 30, 2021, provides a good perspective of the carrier's busy flight deck during her first operational deployment as part of Operation Fortis. Note that 15 UK/US-operated F-35Bs and three Merlin HM2s from the FAA's 820 NAS can be seen atop QE*** *MOD Crown Copyright/Cpl Phil Dye*

group briefly joined the US Navy's Iwo Jima Amphibious Ready Group (ARG) and Ronald Reagan CSG for drills in the Gulf of Aden. It then carried out several drills with the Indian Navy. CSG-21's arrival in the Indo-Pacific signified the UK's commitment to strengthening diplomatic, economic and security ties with India and other allied nations, promoting the freedom of passage through vital trading routes and open and inclusive order.

Following a scheduled port visit to the British Defence Singapore Support Unit (BDSSU) in Sembawang, Singapore, *QE* and her escorts entered the South China Sea on July 26 to conduct freedom of navigation exercises across the area, despite rising tensions in the region: China claims territorial ownership over Taiwan and the South China Sea, and criticises the presence of foreign warships operating in the area – this was no different for CSG-21.

While in the region, CSG-21 used its ASW assets to detect and track Chinese submarines, allowing *QE* and her escorts to avoid them. The carrier's AEW assets also tracked a number of Chinese warplanes, which operated no closer than approximately 150 miles (241km) from the strike group's position.

Moorhouse later told *Sky News*: "In that sort of cat-and-mouse-type game, I am absolutely clear they are turning away at ranges where they are probably using us to facilitate their own training in the same way that we would do towards them. They were not engaging or locking us up or anything like that, but the ranges at which they were flying were indicative of what they would do for real."

On October 3, CSG-21 carried out integrated naval operations in the Philippine Sea with both the US Navy's Ronald Reagan and Carl Vinson CSGs, as well as the Japan Maritime Self-Defense Force's (JMSDF) Hyuga-class helicopter destroyer, JS *Ise* (DDH-182). This drill involved integrated air operations, air-defence scenarios and simulated strikes against naval targets with the aim of strengthening interoperability between the three nations.

After conducting joint drills with the Republic of Korea Navy, CSG-21 began its journey home on October 20. Unfortunately, *QE* experienced her first loss on November 16, when a British F-35B (ZM152/'018') crashed into the Mediterranean while attempting to take off from the carrier. The pilot safely ejected from the jet, which plummeted to the seabed. Following the aircraft's recovery, it was determined that a protective engine intake blank had become stuck down the left intake duct and was almost invisible during pre-flight checks. While the incident was avoidable, it adds to the lessons learned from CSG-21 and will be refined for *POW's* upcoming CSG-25 deployment.

On the prowl

The UK's new carriers can accommodate both the 'Commando' Wildcat AH1s operated by 847 NAS and the Wildcat HMA2s flown by 815 NAS. The former can support UK Commando Helicopter Force (CHF) operations, while the latter typically conducts ASW/ASuW missions while deployed with the UK CSG on operational cruises. The Navy currently fields 28 Wildcat HMA2s from Yeovilton.

While the multi-role maritime helicopters are key to defending the UK CSG from surface/subsurface threats, they would typically deploy aboard the carrier's escort vessels, rather than the 'flattop' itself. Powered by two CTS800-4N turboshaft engines, the HMA2 is fitted with a Seaspray 7400E active electronically scanned array (AESA) multi-mode radar and an MX-15Di electro-optical/infrared (EO/IR) system, which also makes it a potent intelligence, surveillance, target acquisition and reconnaissance (ISTAR) platform.

Fitted with Leonardo's Weapon Wing, the HMA2 can be armed with up to 20 Thales Martlet lightweight air-to-surface missiles or up to four MBDA Sea Venom anti-ship missiles when configured for ASuW operations. For the ASW mission, the Wildcat is capable of using the same weapons as the Merlin HM2 (Sting Ray torpedoes and Mk11 depth charges). The helicopters are also armed with a Browning M3M .50-cal machine gun.

820
AET
820
NAS

Above: ***Air Engineering Technicians (AETs) aboard POW prepare to load a training variant of the Sting Ray acoustic-homing lightweight torpedo onto an 820 NAS Merlin HM2 before the ASW helicopter departed the carrier for a mission during Exercise Steadfast Defender 24 on February 28, 2024*** *MOD Crown Copyright/LPhot Belinda Alker*

Below: ***Equipped with a Leonardo Weapon Wing, this Wildcat HMA2 (ZZ518) from the FAA's 815 NAS conducts the first operational firing of the Thales Martlet lightweight multi-role missile in the Bay of Bengal during the Operation Fortis (CSG-21) deployment on October 16, 2021*** *MOD Crown Copyright/ LPhot Unaisi Luke*

ROYAL NAVY ZZ518

Going Commando

Both Queen Elizabeth-class carriers can launch sustained amphibious operations. Alongside the Merlin HM2s, both vessels can also accommodate the 'Commando' Merlin HC4s operated by 845 NAS 'Junglies' from Yeovilton. A vital part of the CHF, this specialist 'Commando' unit is tasked with providing troop transport and load-lifting support to elements of the Royal Marines that deploy with the carriers – namely 42 Commando, which specialises in maritime operations.

Previously operated by the RAF as the Merlin HC3/3A, the fleet was transferred to the FAA in 2012 to support Commando Helicopter Force operations. As part of the Merlin Life Sustainment Programme (MLSP), 25 HC3/3As were upgraded to HC4-standard and equipped with the same cockpit electronics as the HM2, as well as folding tails and main rotor blades, deck lashing mounting points, a strengthened landing gear, fast-roping points, a common emergency egress system and other obsolescence updates. Flight trials began with the HC4 in 2017, with the variant achieving Initial Operational Capability (IOC) in mid-2018.

The carriers are also rated to carry RAF Chinook HC5s and AAC operated Apache AH2s. The former conducted its first landing aboard QE in February 2018, while the latter – which only achieved IOC in May 2023 – has yet to embark. Despite this, the AH2's predecessor, the Apache AH1 was familiar with the warships, after completing three days of Platform Ship Integration Testing (PSIT) to ensure the gunship could be supported by the carrier while deployed.

Together with the 'Commando' Merlins and Wildcats, the Apaches and Chinooks can be used to form a large littoral manoeuvre package, conducting combat missions near the shore in support of amphibious assaults. With such operations, the Navy says that while the carriers do "not have the surface assault capability with landing craft of the specialist ships, [their] four-acre flight deck provides plenty of scope from which to project manpower and equipment ashore using the variety of helicopters [they] will be able to host".

QE returned to Portsmouth on December 9 after seven months at sea, marking the end of the Navy's most significant peacetime cruise in a generation. While deployed, CSG-21 travelled 49,000nm (56,388 miles or 90,748km) and visited more than 40 countries.

The ascending prince

Despite suffering significant flooding in October 2020, which damaged her electrical cabling and forced the vessel to return to dry dock for eight months, *POW* was declared fully operational in October 2021. On January 11, 2022, she assumed the flagship role of NATO's Maritime High Readiness Force from the French Navy. In this role, *POW* was intended to support NATO exercises in the Arctic, Baltic and Mediterranean for a 12-month period.

POW departed Portsmouth on August 27, 2022, for joint drills with allies off the US East Coast. However, on August 29, she suffered major mechanical issues with her starboard propeller shaft, forcing the warship back to dry dock at Rosyth, which took nine months to complete. *QE* replaced *POW* for the US deployment.

After returning from the US, *QE* embarked eight UKLF F-35Bs and seven helicopters before participating in Operation Achillean in the North Sea, which aimed to validate NATO's new fifth-generation strike capabilities. While deployed from September to December 2022, the CSG participated in large-scale military operations, including ASW drills with RAF-operated Poseidon MRA1 maritime patrol aircraft.

On September 8, 2023, *QE* – complete with eight UKLF F-35Bs, five Merlin HM2s (of which, two carried the Crowsnest ASaC system) and three 847 NAS-operated Wildcat AH1s (in their first deployment aboard the carrier) – embarked on her next major cruise: Operation Firedrake. During this, the CSG – comprising *QE*, *Diamond*, *Kent* and *Tideforce* – completed a series of drills in northern European waters with the UK Joint Expeditionary Force (JEF) and other NATO partners.

POW returned to sea for trials on July 21, 2023, after being repaired at Rosyth. While *QE* was engaged in operations associated with Firedrake in September, *POW* began trials with various UAV systems designed for the resupply mission. Partnering with the UK-based firm, W Autonomous Systems (WAS), these trials sought to evaluate the feasibility of drones delivering up to 220lb (100kg) of supplies to the UK CSG while deployed.

History was made on September 8, when a WAS-designed cargo UAV successfully landed on the deck of *POW* off the Cornish coast, delivering supplies to the 'flattop' before returning to Predannack Airfield, Cornwall. This twin-engine, twin-boom UAV – which is capable of carrying a 220lb (100kg) payload at ranges of up to 621 miles (1,000km) – was the second fixed-wing aircraft type to operate from the Queen Elizabeth-class warships.

After deploying to the US East Coast, *POW* marked another major milestone on November 15, when a General Atomics Aeronautical Systems (GA-ASI)-operated Mojave UAV took off and landed back on the carrier's deck in what was the first trial of its kind. A variant of the MQ-1C Gray Eagle MALE UAV that has been adapted for short

Owned and operated by GA-ASI, this Mojave UAV (N450MV) – a specially modified STOL variant of the MQ-1C Gray Eagle – takes off from the deck of POW during a unique trial off the US East Coast on November 15, 2023. This trial showcased the carrier's ability to operate large, fixed-wing UAVs alongside manned fifth-generation assets
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take-off and landing (STOL) operations, the drone – being 6m (20ft) wider than an F-35B – was the largest aircraft of its type to be operated from a non-US 'flattop'.

This trial demonstrated how modern, fixed-wing UAVs can be operated alongside crewed assets, such as the F-35B. Rear Adm James Parkin, the Royal Navy's Director Develop, whose team planned the trial, said: "The success of this trial heralds a new dawn in how we conduct maritime aviation and is another exciting step in the evolution of the Royal Navy's [CSG] into a mixed crewed and uncrewed fighting force."

POW embarked on her first major deployment when she participated in Exercise Steadfast Defender 24 – the largest NATO-led exercise to be held since the end of the Cold War – from January to May 2024. Initially, *QE* was scheduled to take part in the drill, but faults with the warship's starboard propeller shaft resulted in her being dry-docked for repairs until July. While operating off the Norwegian coast during Steadfast Defender, *POW* and her CSG participated in the UK-led JW 24-1, before taking part in the Norwegian-led Exercise Nordic Response 24, which culminated with *POW* leading a 15-ship formation that combined the UK CSG with a NATO Amphibious Task Group. *POW* returned to Portsmouth on March 26.

From October 14-27, *POW* ventured into the North Sea for Exercise Strike Warrior 24, which played a key role in preparing the carrier and her strike group for CSG-25. The drill involved personnel from 809 NAS 'Immortals' and the wider UKLF, marking the first time that an FAA-badged fast-jet squadron had operated from a British 'flattop' in nearly 15 years. Eight F-35Bs joined *POW* for this deployment, allowing 19 pilots to gain their carrier qualifications. During Strike Warrior, F-35Bs flew 71 sorties (totalling 210 flight hours) from *POW* and dropped four Paveway IV laser-guided bombs (LGBs) on the Cape Wrath Training Area in Sutherland, Scotland.

Having concluded Strike Warrior, *POW* is regrouping with the UK CSG to conduct more vital training before the task force embarks on the carrier's first long-term deployment to the Indo-Pacific, scheduled to begin in April. CSG-25 will closely mirror that of CSG-21, but with *POW* leading the fleet.

While details regarding the number of vessels and aircraft that will support this deployment have yet to be publicly released, the mission – which will last for several months – will see the UK CSG participate in a series of exercises/operations while supporting Westminster's goal of strengthening and fostering political and defence relationships with partners in the Far East and demonstrating its commitment to promoting a free and open Indo-Pacific. **afm**

As aircraft maintainers work on the four F-35Bs visible on her flight deck, POW steams through the North Sea during Exercise Strike Warrior 24 on October 24, 2024. This exercise provided an opportunity for the carrier, her air wing and other UK CSG vessels to conduct work-up activities ahead of the global CSG-25 deployment this year
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From Paris with hope

As the Ukraine Air Force prepares to receive the first of its Dassault Mirage 2000-5s from the French Air and Space Force (FASF), Mina Adel explains what makes the delta winged jet so special

Ukraine has been working on strengthening its air force since war broke out with Russia in 2022. Last year came the first F-16s, and in the coming weeks some French Mirage 2000-5 fighters should arrive to become the second western fighter. It will now join forces with its primary competitor in the 1990s. But there will be no time to celebrate; they have a lot of work to do, as the Ukrainians prepare for an upgrade.

Sébastien Lecornu the French Minister of the Armed Forces stated on X (formally Twitter) in October 2024: “Mirage 2000s bound for Ukraine: delivery still scheduled for the 1st quarter of 2025.” Adding, “The training of Ukrainian pilots and mechanics continues.”

According to the French daily, ‘*Le Tribune*’ the first batch will be made up of three Mirages, delivered in the first quarter of 2025 when the pilots and ground personnel complete their training.

Designed to hunt

Unlike the F-16s, the Mirage-2000 was built from the outset to be a tactical fighter focused primarily on carrying out air defence operations. As a result, it shows a balance of great aerodynamic characteristics and speed, making them suitable for Quick Reaction Alert (QRA) missions.

Ian Black, a former British exchange pilot in France told me: “The Mirage 2000C is a pure fly-by-wire Delta, and very ‘French’ in that it has everything ‘in house’. It is small in size, single engined, and can carry a large amount of weapons. With only one engine, the fighter is pretty good on fuel burn. The hardest part of the Mirage 2000 is the Delta wing philosophy. So, you have to fly and fight the Mirage 2000C in a certain way.” He concluded: “I flew the Tornado F3 and also F-15/16 and F/A-18 and lots of others, but what makes the Mirage 2000 very useful for Ukraine is its reliability and proven track record – it has a fantastic Distributed Aperture System (DAS) sensor suite and is highly maneuverable.”

French President Emmanuel Macron announced last June that Ukraine will get the Mirage 2000-5 variant. The FASF has 26 of these, specially built to ensure air supremacy in the early 2000s. It sports improved cockpit instruments through the new Sextant Comète system, which includes a wide-angle HUD (Head up Display), three HDDs (Head Down Displays), a head-level display and Hands on Throttle and Stick (HOTAS). An upgraded GPS device, a Multifunctional Information Distribution Systems (MIDS) datalink and the ability to integrate the Thales Scorpion Helmet Mounted Display (HMD) that can direct air-to-air missiles by sight will all assist the pilot on his mission.

The radar is a doppler, or Radar Doppler modèle Y (RDY) in French, which is a multifunction X-band (I-band) Doppler radar with a lookdown/shootdown capability to detect and strike low-flying targets in air-to-air mode, with a maximum range of 80 miles (130 km). With the ability to classify up to 24 potential target aircraft, track eight, and shoot four down at the same time, it is equivalent to US airborne radars like the AN/APG-68 and AN/APG-63 on the F-16 Block 50/52 and F-15C/D.

Mirage 2000-5s can carry six MICA EM/IR missiles, each having fire-and-forget mode and a range of 40-50 miles (60-80 km).

One of the Mirage’s most significant strengths is electronic warfare, and this unique version has the updated Integrated Counter Measures Suite (ICMS), along with the Samir DDM missile warning system consisting of three RWR, two detector jammers and a chaff/IR flare dispenser. All parts are linked to the same management unit and can be employed automatically when needed.

The French Minister of the Armed Forces has said: “In Cazaux they will be equipped with new equipment: air-to-ground combat and anti-electronic warfare defense.”

Left: ***The Mirage 2000-5F is the single-seat version of the delta wing fighter serving with the French Air and Space Force, primarily fulfilling an air defence role. In contrast, Ukrainian-operated examples are expected to see significant air-to-ground employment, with the potential to deploy advanced weaponry such as the SCALP-EG*** *Daniele Faccioli*

Above: ***A pair of Norwegian F-16As from 331 Skvadron formates with two French Air Force Mirage 2000s of EC2/5, during an exchange at Orange Air Base in France in 1996*** *Ian Black*

Below Right ***Groupe de Chasse 1/2 Cigognes, seen during routine operations at Luxeuil Air Base, is the last operational stronghold of the 'Dash Five' variant. Initially, the Mirage 2000-5Fs of the Cigognes squadron were planned to remain in service until 2028 or 2029, in preparation for the transition to the Rafale F4. However, new strategic commitments towards Ukraine are expected to lead to an earlier phase-out of these aircraft*** *Daniele Faccioli*

This is extremely sensible, because the French version was created just for air combat and does not have the ability to carry air-to-ground munitions. This brings it closer to the superior version Mark 2, which has numerous features like the 'ICMS 3' digital countermeasures suite upgrade. This may make it similar to Greek and Emirati Mirage 2000s with integration of Link-16 datalinks, tactical reconnaissance pods, guided bombs and standoff-range missiles.

Deadly Challenges Ahead

The Russian Air Force was able to establish a kill web near the frontlines based on a formidable multi-layered defensive wall consisting primarily of S- 400/300 air defense systems with a range of 25-240 miles (40-380km), Buk M1/2/3 medium systems with a range of 25-45 miles (40-70km), several short-range air defense systems (SHORAD), and many specialized electronic jamming systems to neutralise the threat of air attacks by the deception of air munitions guidance. This defence network is strengthened with A-50 *Mainstay* airborne early warning (AEW) and IL-20M *Coot* aircraft, that provides electronic and intelligence support, boosts air defense coverage with full co-ordination, and identify aircraft attacking at low altitude.

The Ukrainian Air Force's sworn enemy, the Su-35 *Flanker-E*, uses the Irbis-E radar capable of launching the new R-37M (AA-13 *Axehead*) long-range missiles with two datalink antennas, that can be data-linked between aircraft to hit targets at a distance of 95-125 miles (150-200km). Additionally, it employs R-77-1 (AA-12 *Adder*) missiles, with a range of 70 miles (110km) that can be launched using Track with Scan (TWS) rather than locking on the opponent and initiating their radar warning receiver. All of this is in addition to the electronic warfare equipment capable of blinding Ukrainian radar's ability to shoot down Russian aircraft.

These factors ensured Russian air superiority in the battle, securing the skies near the front lines, giving Su-34 *Fullback* bombers more space to carry out bombing missions with UMPK glide bombs, and forcing the Ukrainians to request western fighters, like the F-16 and French Mirage, to deal with these threats.

Defensively, the Ukrainian pilots relied on several tactics to minimize losses, not only through dispersed formations on the ground and the use of highways as landing strips, but also in the air. They relied on ultra-low flying, defensive maneuvres, and an attempt to co-ordinate the fight through deception to confuse the Russian formations and drag them into air defence ambushes in the first days of the battle.

Offensively, the Ukrainian combat expansion has looked to target more Russian air

India has learnt how to operate Mirage 2000s with Russian systems and could show Ukraine a thing or two about working with MiG-29s
Alan Warnes

defences over the past few months, especially the S-400/300 systems on the one hand, and maneuvering ground-based air defenses to hunt bombers, fighters, and even early warning aircraft inside the Russian borders. It is possible to consider all these efforts to prepare the field for western aircraft, which can operate a bit more comfortably near frontlines during combat missions, which is why the Ukrainian Air Force is trying to get as much as possible from its new aircraft.

Fight smarter not harder

Logically, Western aircraft such as the F-16 and Mirage-2000 will operate differently from the Soviet aircraft in the Ukrainian inventory. As the French Mirage joins the war, what can we expect from these aircraft fighting the complex Russian-Ukrainian battle?

Indian Group Captain (Dr) MJ Augustine Vinod VSM (retd.) told the author: “The Mirage 2000, particularly in its upgraded variants, can carry an array of stand-off weapons such as precision-guided bombs and the cruise missiles. These munitions allow the Mirage to strike high-value targets from a distance, without entering the kill zone of systems like the S-400, which can engage aircraft from up to around 250 miles (400km) away.”

Moreover, regarding the tactics, he added: “In a conflict involving complex air defence systems and highly maneuverable fighters, the Mirage 2000 should adopt a hit-and-run strategy. Here, electronic warfare plays a critical role. While the Mirage 2000 is not a stealth aircraft, it can benefit from co-ordinated electronic jamming provided by either dedicated EW platforms such as the E/A-18 Growler or its own on-board systems to mask its approach and increase survivability.

“This tactic is similar to the use of aircraft like the F-16CM in SEAD (Suppression of Enemy Air Defences) roles, where strike aircraft rely on EW support to break through dense air defence networks.”

This necessitates a high level of collaboration and integration between fighters. Although it will not be a problem to integrate the F-16 and Mirage, it will require the Ukrainian Air Force to employ data links, something that is now on the table, and which could build towards the introduction of Swedish Saab 340B AEW&C aircraft. According to CNN, top US military commander in Europe Gen Chris Cavoli, has compiled a list of American weapons systems that could aid Ukraine including Link-16. In this case the Mirage 2000-5 will give the UKrAF the flexibility in the beyond visual range (BVR) fight to exchange roles with F-16s according to the scenario.

NATO has a lot of experience working with the best multirole fighters that have participated in multiple military operations, and many of their combat tactics are tested in annual multinational exercises such as TLP in Spain (see page 56-57), Iniochos in Greece, and Volfa in France. The question now is whether it is feasible to integrate Mirage aircraft with the UkrAF’s Soviet planes to create effective fighting momentum on the battlefield?

Vinod explains two ways of interoperability in joint operations. “First, India’s Air Force is a prime example of successfully employing diverse fighter platforms in unified operations. The Mirage 2000 has been used extensively in the IAF, alongside MiG-29 *Fulcrums* and Su-30MKI *Flankers,* for various roles, each aircraft fulfilling a unique function. The Mirage 2000 is often employed for Counter-Air Operations, precision strikes,

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A Russian S-400 surface-to-air missile defence system sees two Su-35 Flanker-Es flying over, during the Ukraine War in November 2023
Russian MOD

2-EM
ARMEE DE L'AIR
2-EA
ARMEE DE L'AIR
49

The Mirage 2000-5F remains a crucial asset for the FASF, consistently performing QRA duties to safeguard national airspace and occasionally supporting NATO missions, like Baltic Air Policing. The Dash Five variant introduced the ability to deploy MICA EM and MICA IR medium-range air-to-air missiles, enhancing the Mirage's operational versatility and combat effectiveness Daniele Faccioli

and escort missions, while the MiG-29 and Su-27/Su-30 focus on air superiority and strike missions."

He continued: "The second is the electronic warfare and escorts angle. The Mirage 2000, with its strong EW capabilities, can act as an escort for strike packages composed of MiG-29s or Su-27s. By suppressing or confusing enemy air defences, the Mirage can provide a safer corridor for these strike aircraft to reach their targets and return."

It may take some time for Ukrainian pilots to master such tactics, thus we should expect to see gradual changes in mission types and outcomes. The primary challenge is keeping aircraft safe from missile strikes and Russian loitering munitions. Consequently, success with such Western aircraft necessitates the construction of a comprehensive defensive and offensive strategy.

Lessons for NATO Fighters

NATO is keen to train in many exercises in Europe or the Pacific, using Western aircraft 'aggressors' to simulate Russian aircraft by implementing similar known tactics or by inviting Russian-origin aircraft owned by allies in order to develop counter-tactics.

However, the Ukrainian war is providing a priceless opportunity to study Eastern aviation up close, not only by observing Ukrainian pilots' approaches but also by pushing for more European fourth generation aircraft such as the F-16 and Mirage, which can be equipped with intelligence and signal reconnaissance systems to study Russian air defenses.

Last August the 68th Electronic Warfare Squadron stated on its website: "To effectively integrate the F-16 into the Ukrainian Air Force, its EW subsystems required reprogramming to be effective against evolving Russian threats in the spectrum. The 68th EWS took this challenge head-on given the urgent priority it represents to the US and our partners.

These efforts can help to form what is called a 'threat library', a database containing information regarding the adversary's air defense systems and order of battle. ELINT/SIGINT (electronic intelligence/signals intelligence) platforms are responsible for collecting information and this can be achieved through dedicated planes or external pods like ASTAC on Mirages.

Although the study of eastern defense systems is a vital factor for NATO air forces in winning any future battles, so is study of the impact of Western guided munitions in achieving decisive results. Despite the modification of many Ukrainian aircraft to use Western guided munitions to a limited degree of capability, the advent of original Mirage-2000 aircraft to use AASM guided bombs and SCALP stealth missiles will provide more tactical benefits in the many scenarios, such as ability to retarget midflight.

All of these experiences will undoubtedly influence many NATO air force doctrines and tactics, which will investigate evolving changes in air warfare and implement lessons, learning gained from simulations and exercises, both internally and in international exercises to attain maximum combat effectiveness in future fights. **afm**

AVION
ROULABLE

As well as training Ukrainian pilots to fly the Mirage 2000, the French have also been training engineers, ensuring the aircraft can remain airworthy Daniele Faccioli

Ukraine's combat aircraft fleet

Still in the fight

As the war in Ukraine approaches its third anniversary, **Vladimir Trendafilovski** details the air war so far and how Ukraine's air forces are growing even stronger

In the early morning of February 24, 2022, the Russian armed forces launched their all-out invasion of Ukraine. Wrongfully believing that the Ukrainian Armed Forces would disintegrate under their initial 'shock and awe' tactics, the Kremlin had envisaged this modern-day Anschluss of Ukraine as a short-term 'special military operation' that would last only a few weeks at the most. However, they gravely misjudged the will for freedom and independence of the Ukrainian people – three years on, there is no end in sight to the conflict in Ukraine. On the contrary – the fighting continues to escalate further, causing devastating losses on both sides with far-reaching global consequences.

The Ukrainian Air Force (UkrAF) and its seemingly endless combat aircraft fleet remain an unsolvable puzzle for Russia which still throws all possible weapons against it in the hope of finally destroying it. Despite significant losses in men and materiel, the UkrAF remains in the fight – inflicting considerable damage to the Russian war machine every day. Furthermore, it is currently integrating new Western aircraft and weapons which will significantly boost its combat performance and capabilities.

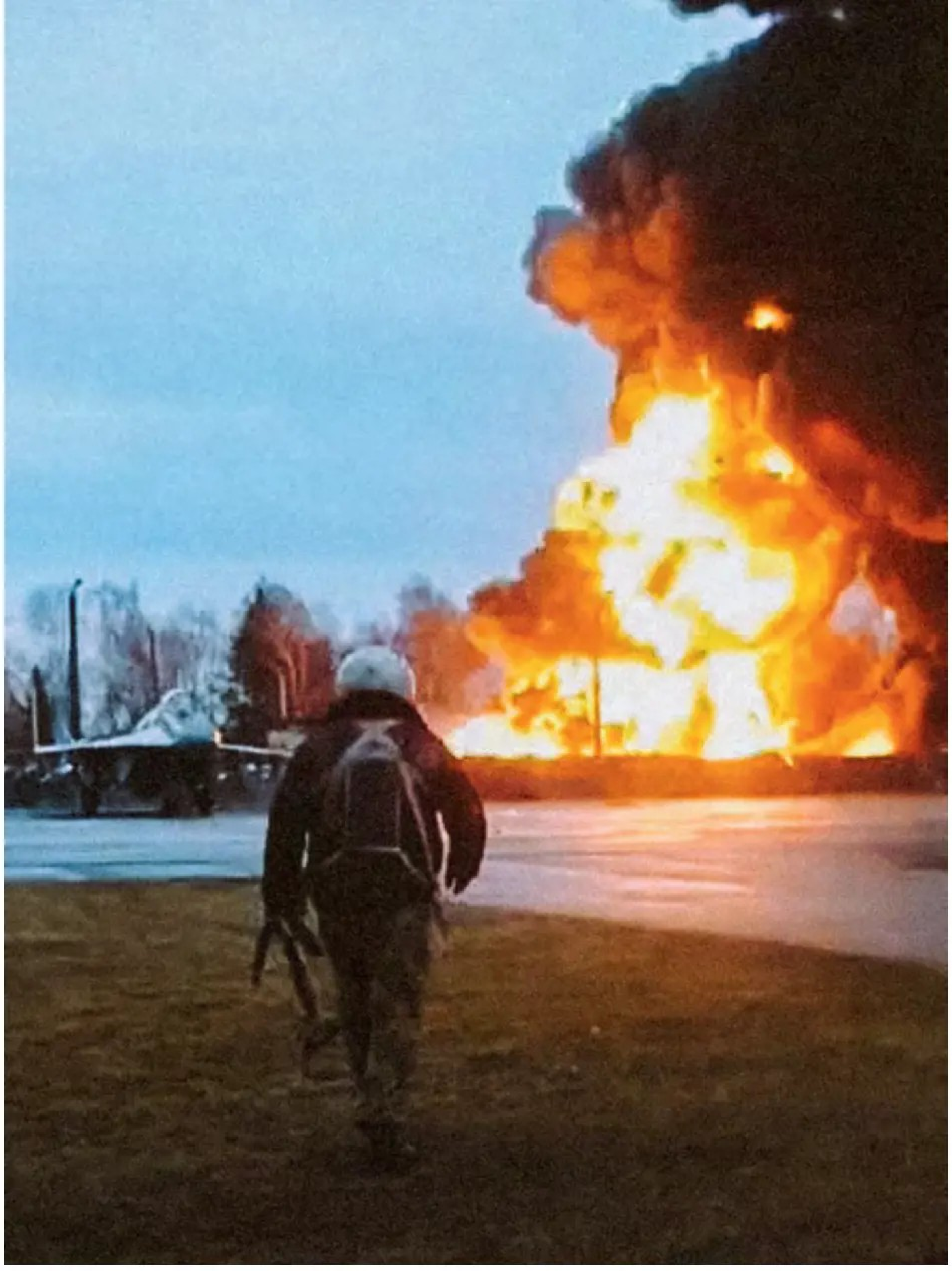
At the beginning of the war

The UkrAF had some 150 active combat aircraft in February 2022 – 55 MiG-29s, 40 Su-27s, 25 Su-24s and 30 Su-25s. The strike aircraft were with two units, directly subordinated to the UkrAF Command – 7th Tactical Aviation Brigade (brTA) at Starokostiantyniv Air Base (AB) had Su-24s while 299th brTA at Mykolaiv-Kulbakino AB had Su-25s. The fighter aircraft were with five units – 39th brTA at Ozerne AB and 831st brTA at Myrhorod AB had Su-27s, while 40th brTA at Vasylkiv AB, 114th brTA at Ivano-Frankivsk AB and 204th brTA at Lutsk AB had MiG-29s. The 39th, 40th and 831st brTA were under Air Command (AC) Centre, while the 114th and 204th brTA were under AC West.

With the exception of the Su-24s, the bulk of UkrAF's combat aircraft was overhauled in the previous decade and many of them were modernized. Unfortunately, these upgrades were primarily aimed at improving outdated navigation systems. As a result, combat capabilities did not improve significantly as their weapons inventory remained practically unchanged. The lack of modern self-protection suite with an integrated electronic countermeasures (ECM) system, plus the lack of any kind of long-range high-precision 'fire-and-forget' air-to-air or air-to-ground weapon, reduced the combat performance and survivability on today's battlefield.

Three years of war

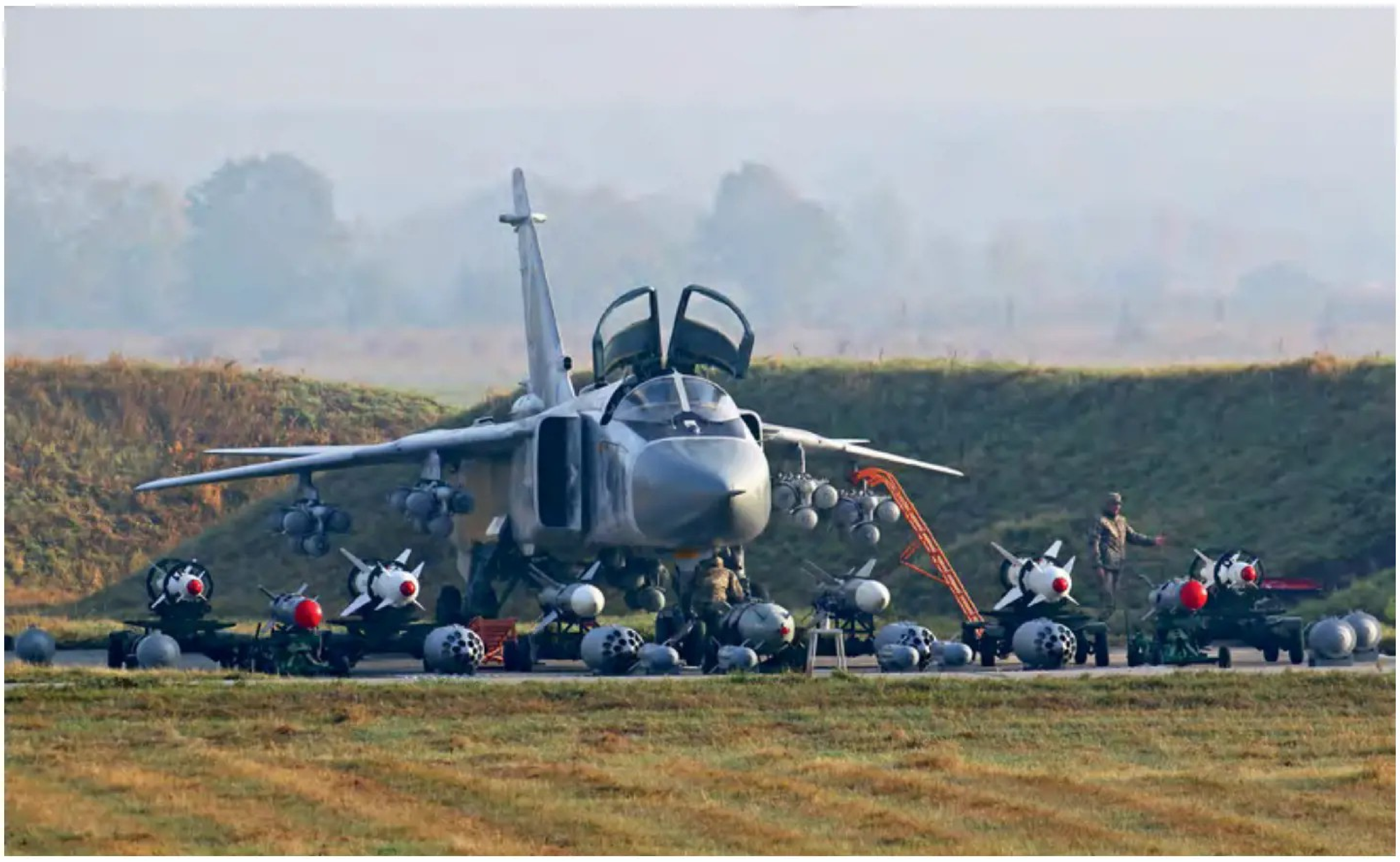
In the last three years of war, the UkrAF's combat aircraft fleet went through a number of phases, all with unique aspects. The initial phase, lasting until the stabilization of the frontline in early April 2022, was certainly the most challenging – not just for the UkrAF, but also



Above: **In the first days of the war the situation was chaotic, but UkrAF pilots never stopped flying – here a 40th brTA pilot walks to his MiG-29 in the aftermath of a Russian missile strike** UkrAF Command

Left: **The fully armed F-16AM J-367 departs for the last Dutch F-16 training ('Tango') QRA scramble at Volkel AB on March 28, 2024, armed with live AIM-9X and AIM-120B AAMs. On September 16, it was delivered to the UkrAF together with aircraft J-003, J-005, J-014, J-016 and J-017** Gert Kromhout

Below: **UkrAF technicians hard at work, ensuring that a restored MiG-29 type 9-13 of 40th brTA remains serviceable and always combat ready. These procedures sometimes take hours before a flight, requiring many specialists for each of the aircraft's main systems and weapons. Such 'invisible men' are not only behind each successful sortie, but also behind UkrAF's remarkable recovery from its initial losses – in a very short amount of time, they managed to return to service dozens of stored aircraft, some of which have not flown for over a decade** UkrAF Command



Left: ***A rare UkrAF Su-24M in the post-overhaul grey digital paint scheme and its formidable Soviet-era weaponry on display – including a variety of iron bombs, unguided air-to-ground rockets, KAB-500Kr and KAB-1500L guided bombs, Kh-25ML and Kh-29L laser-guided AGMs and the Kh-58U ARM*** *Sergey Smolentsev*

for Ukraine itself. Undoubtedly, this was the crucial moment when Ukraine's dogged determination stopped the Russian steamroller dead in its tracks. Against all odds, and contrary to most expectations, the UkrAF managed to survive the initial Russian onslaught and conserve most of its original Soviet-era aircraft fleet (stored aircraft included), while simultaneously repelling a vastly superior enemy, both in the air and on the ground. As is evident from the list of losses, this came at a cost – over 30 aircraft (a fifth of the active aircraft fleet) and 30 pilots were lost in this period – which is practically half of all the confirmed losses. This should not come as a surprise – in this period the UkrAF came up close and personal with the enemy – the strike aircraft engaged ground targets in low-level bombing and strafing runs using iron bombs and unguided air-to-ground rockets while the fighters engaged both ground and air targets, exposing themselves to the enemy's ground-based air defence (GBAD) systems and fighter aircraft on combat air patrol (CAP) sorties.

Below: ***Two stored MiG-29 type 9-13 aircraft (including '45 White') of the 114th brTA at Ivano-Frankivsk AB, destroyed during one of the initial missile strikes in February 2022*** *Ukrainian Internet Resources*

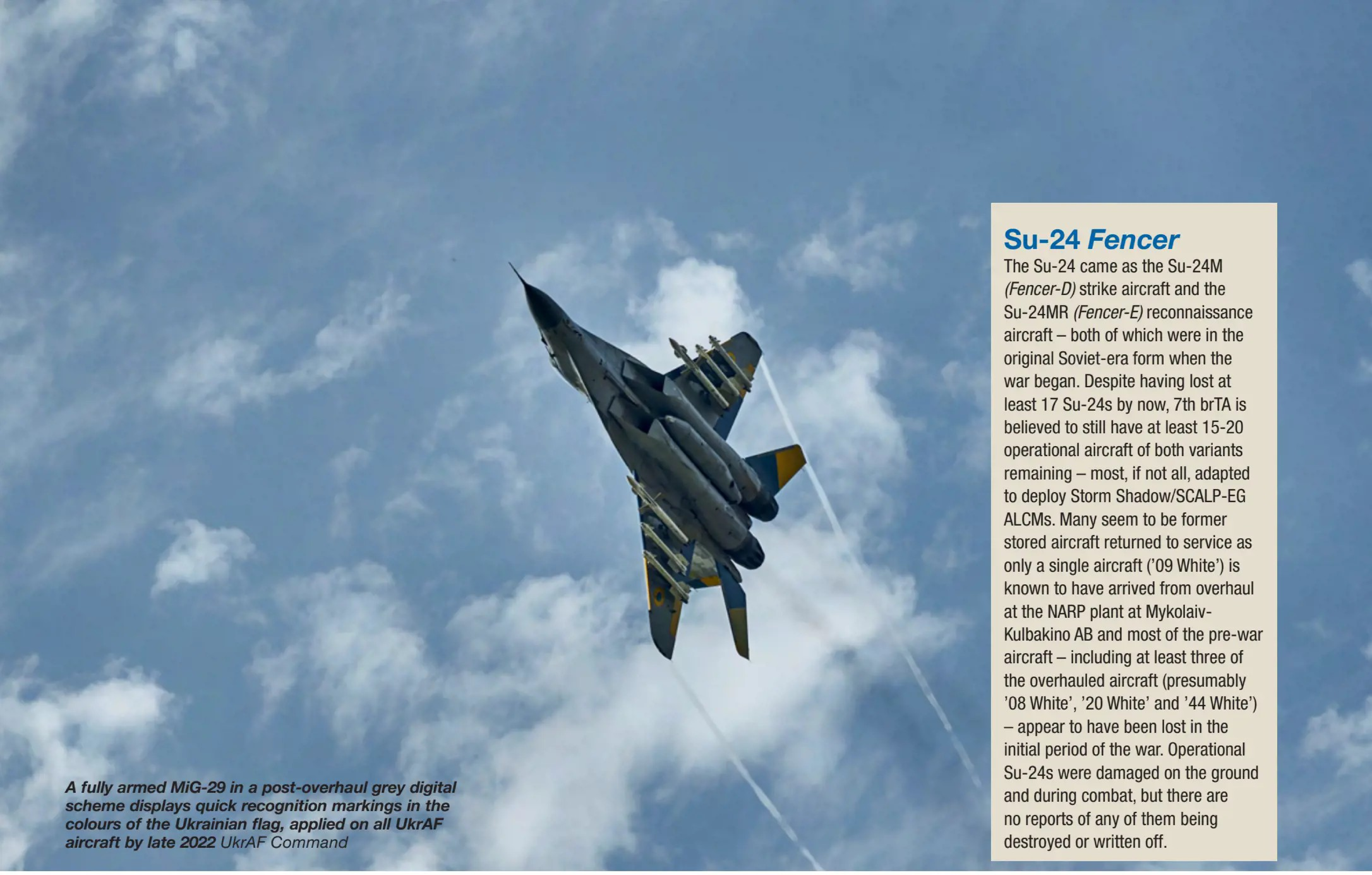
MiG-29 *Fulcrum*

The MiG-29 is the mainstay of UkrAF's combat aircraft fleet and UkrAF originally had three variants – the original Soviet single-seat MiG-29 type 9-13 *(Fulcrum-C)* and its modernized MiG-29MU1 variant, plus the two-seat MiG-29UB *(Fulcrum-B)*. The MiG-29UB lacks radar and therefore cannot deploy the R-27R BVR AAM. In addition to its own stored aircraft, which were pressed in service directly or after overhaul to cover the high wartime losses, the UkrAF also received 19 MiG-29 9-12A *(Fulcrum-A)* and four MiG-29UB from Poland and Slovakia in 2023. Of these, Slovakia provided 11 single-seat and two two-seat aircraft (nine and one of these modernized to MiG-29AS and MiG-29UBS, respectively), the remaining eight plus two aircraft arriving from Poland. Additional four decommissioned aircraft were reportedly transferred from Poland later on, but this is unconfirmed. While some of the aircraft were modernized (easily distinguishable by extra antennas on the nose and/or spine, which are otherwise absent on UkrAF aircraft), they had the same combat capabilities as the Soviet original. Just a portion of the ex-Polish and ex-Slovakian aircraft returned to operational service, the rest became sources of spare parts. Furthermore, Poland has 14 (11 single-seat and three two-seat) aircraft remaining in service, which are also slated for transferring later – pending their replacement with new aircraft. Note that the UkrAF also operated ex-Soviet MiG-29 9-12 aircraft – withdrawn from service a decade before the war.

The MiG-29 fleet suffered the highest losses, which should not come as a surprise as these were also used for air-to-ground sorties in the initial period of the war. Two from the confirmed 21 aircraft lost crashed during night-time interceptions against Russian cruise missiles and/or drones – MiG-29 9-13 '10 Blue' of 204th brTA on October 12, 2022, and an unidentified aircraft on February 10, 2023 – both without casualties. The former collided with debris of a destroyed Shahed-136 drone while the latter suddenly lost control while on an identical mission – it is presumed that this was a 'friendly fire' case.

In addition to these, there are numerous Russian reports about MiG-29s destroyed on the ground as result of drone/SSM strikes in 2023 and 2024 at various temporary bases near the front line – usually at Dnipro airport, Dolhintseve AB and Mykolaiv-Kulbakino AB. In most cases, videos are usually made available, and these appear to predominantly portray decoy aircraft. However, there are several cases when it appears that the claims are substantiated – these include single-seat MiG-29s destroyed on September 25, 2023 (at Mykolaiv-Kulbakino AB), April 20 and August 16, 2024 (both at Dnipro airport) plus the one damaged by a Lancet drone on September 19, 2023 (at Dolhintseve AB).

Finally, MiG-29MU1 '22 White' of 40 brTA was unscathed after an emergency landing in a field in the Dnipropetrovsk Oblast on April 30, 2024, and returned to service. The cause for this incident remains unknown.



A fully armed MiG-29 in a post-overhaul grey digital scheme displays quick recognition markings in the colours of the Ukrainian flag, applied on all UkrAF aircraft by late 2022 *UkrAF Command*

Su-24 *Fencer*

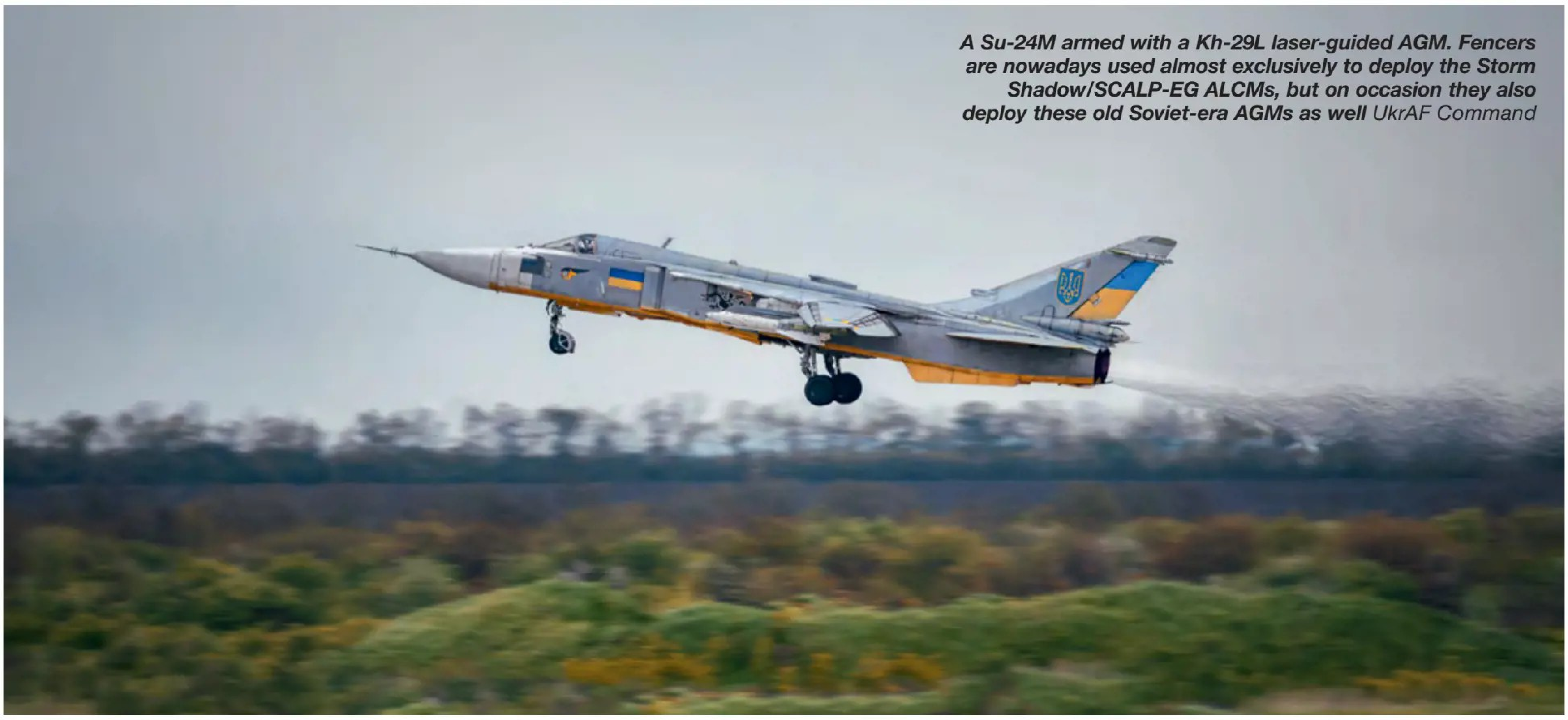
The Su-24 came as the Su-24M *(Fencer-D)* strike aircraft and the Su-24MR *(Fencer-E)* reconnaissance aircraft – both of which were in the original Soviet-era form when the war began. Despite having lost at least 17 Su-24s by now, 7th brTA is believed to still have at least 15-20 operational aircraft of both variants remaining – most, if not all, adapted to deploy Storm Shadow/SCALP-EG ALCMs. Many seem to be former stored aircraft returned to service as only a single aircraft ('09 White') is known to have arrived from overhaul at the NARP plant at Mykolaiv-Kulbakino AB and most of the pre-war aircraft – including at least three of the overhauled aircraft (presumably '08 White', '20 White' and '44 White') – appear to have been lost in the initial period of the war. Operational Su-24s were damaged on the ground and during combat, but there are no reports of any of them being destroyed or written off.

It was in this period when all their deficiencies came to light, especially the lack of modern weapons. This was most obvious when UkrAF fighters were pitted against modern Russian fighters, armed with modern beyond visual range (BVR) air-to-air missiles (AAMs) with active radar homing (ARH) seekers, enabling them to engage UkrAF aircraft from safe distances, well out of reach of their Soviet-era AA-10 *Alamo* AAMs or UkrAF's long-range surface-to-air missile (SAM) systems.

As the conflict progressed and the front line stabilized, direct contact with the enemy was brought to the minimum – strike aircraft conducted stand-off strikes with unguided air-to-ground rockets, while fighter aircraft supported them, with the use of AGM-88 High-speed Anti-Radiation Missile (HARM) – the first Western-supplied weapon successfully integrated on UkrAF's MiG-29s and Su-27s.

Initial combat losses were soon replaced by stored aircraft and by Soviet-built aircraft provided by partner countries – the first were four Su-25s from North Macedonia arriving in 2022, followed by ten MiG-29s from Poland and 13 MiG-29s from Slovakia in 2023. Depending on their condition, some of these were pressed into service immediately, some underwent repairs/overhaul at the LDARZ and ZDARZ plants (in Lviv and Zaporizhzhia, respectively), along with a number of UkrAF's stored aircraft, while the rest became a source of spare parts.

With Soviet-era weapons becoming scarcer – especially unguided air-to-ground rockets – in 2023 the UkrAF began integrating new Western weapons, predominantly precision-guided munitions (PGMs). First came the US-built Joint Direct Attack Munition – Extended Range (JDAM-ER) guided glide bomb, followed by the UK/French-built Storm Shadow/SCALP-EG air-launched cruise missiles (ALCMs), US-built Small Diameter Bomb (SDB)



A Su-24M armed with a Kh-29L laser-guided AGM. Fencers are nowadays used almost exclusively to deploy the Storm Shadow/SCALP-EG ALCMs, but on occasion they also deploy these old Soviet-era AGMs as well *UkrAF Command*

A two-seat Su-25UBM1K during a training flight. The entire UkrAF two-seat Su-25 fleet is believed to be intact as it was used almost exclusively for pilot training UkrAF Command

Su-25 *Frogfoot*

The Su-25 came in two variants – the single-seat Su-25 *(Frogfoot-A)* and two-seat Su-25UB *(Frogfoot-B)* with identical combat capabilities. The pre-war fleet was almost fully modernized during overhaul, the aircraft receiving an M1 or M1K suffix, depending on the implemented upgrade package. A total of 17 aircraft are confirmed lost so far – wartime losses being covered from stored aircraft and from three Su-25s and a single Su-25UB arriving from North Macedonia in 2022. Currently there are 15-20 aircraft remaining – up to eight being Su-25UBs since they are used only for training. Five aircraft are known to have arrived from overhaul, including two ex-Macedonian Su-25s (’50 Blue’ and ’51 Blue’). Finally, in addition to the losses in the list, two unidentified aircraft are confirmed lost on the ground – one because of the Russian missile strike at Dnipro airport on April 10, 2022, and one following a Lancet drone attack at Dolhintseve AB on October 10, 2023. Additional losses have been claimed by Russian sources, predominantly at Dolhintseve AB in 2023 and 2024, but all these seem to have been decoys.

guided glide bomb and finally, the French-built AASM-250 Hammer guided glide bomb. This not only provided much-needed range, precision and effectiveness on target – features that its Soviet-era weapons lacked – but also took care of the weapons shortage problem.

In 2024, the UkrAF had reached a new milestone – integrating a modern Western multi-role fighter aircraft in its inventory – the US-built F-16 Fighting Falcon (aka ‘Viper’), with the French Mirage 2000 expected to arrive in early 2025. Both aircraft are equipped with modern self-protection suites and use modern ‘fire-and-forget’ long-range AAMs, which finally closed the technology gap between Ukrainian and Russian fighter aircraft – something that was unimaginable three years earlier.

UkrAF’s combat aircraft weaponry

In addition to a wide variety of Soviet-era unguided air-to-ground weaponry – bombs and rockets of various calibres, with multiple types of warheads suited for different types of targets – UkrAF’s strike aircraft also had at their disposal various Soviet-era air-to-ground missiles (AGMs). These include the Kh-25M (AS-10 *Karen*) and Kh-29 (AS-14 *Kedge*) series, of which laser-guided variants – the Kh-25ML and Kh-29L respectively – were predominantly used.

While Soviet-era guided bombs are also available to the UkrAF – including the TV-guided KAB-500Kr and laser-guided KAB-1500L – none seem to have been utilized in the conflict so far, no doubt due to the fact that they have to be released from high altitudes and near the intended target, which forces the aircraft to get within range of the enemy’s GBAD.

Finally, there was also a Soviet-era anti-radiation missile (ARM) available – the Kh-58U (AS-11 *Kilter*) – its use from the Su-24M was reported, but pictures have not surfaced so far. Note that the Su-24M would have to carry the special Fantasmagoriya pod below the fuselage to employ these.

With the introduction of Western weapons, the combat capabilities of UkrAF’s combat aircraft were significantly increased. The first weapon to enter service was the AGM-88 HARM, which

A Su-27S departs on a combat mission in the early stage of the war armed with only four R-27ER BVR AAMs. The aircraft has the typical post-overhaul blue digital scheme applied at ZDARZ in the last decade. The unpainted replacement canopy suggests that this aircraft could be one of those damaged at Ozerne AB on March 7, 2022 UkrAF Command

This Su-25M1K of 299th brTA is seen in the summer of 2023, armed with a pair of four-shot LAU-10 rocket pods with US-supplied Zuni air-to-ground rockets *UkrAF Command*

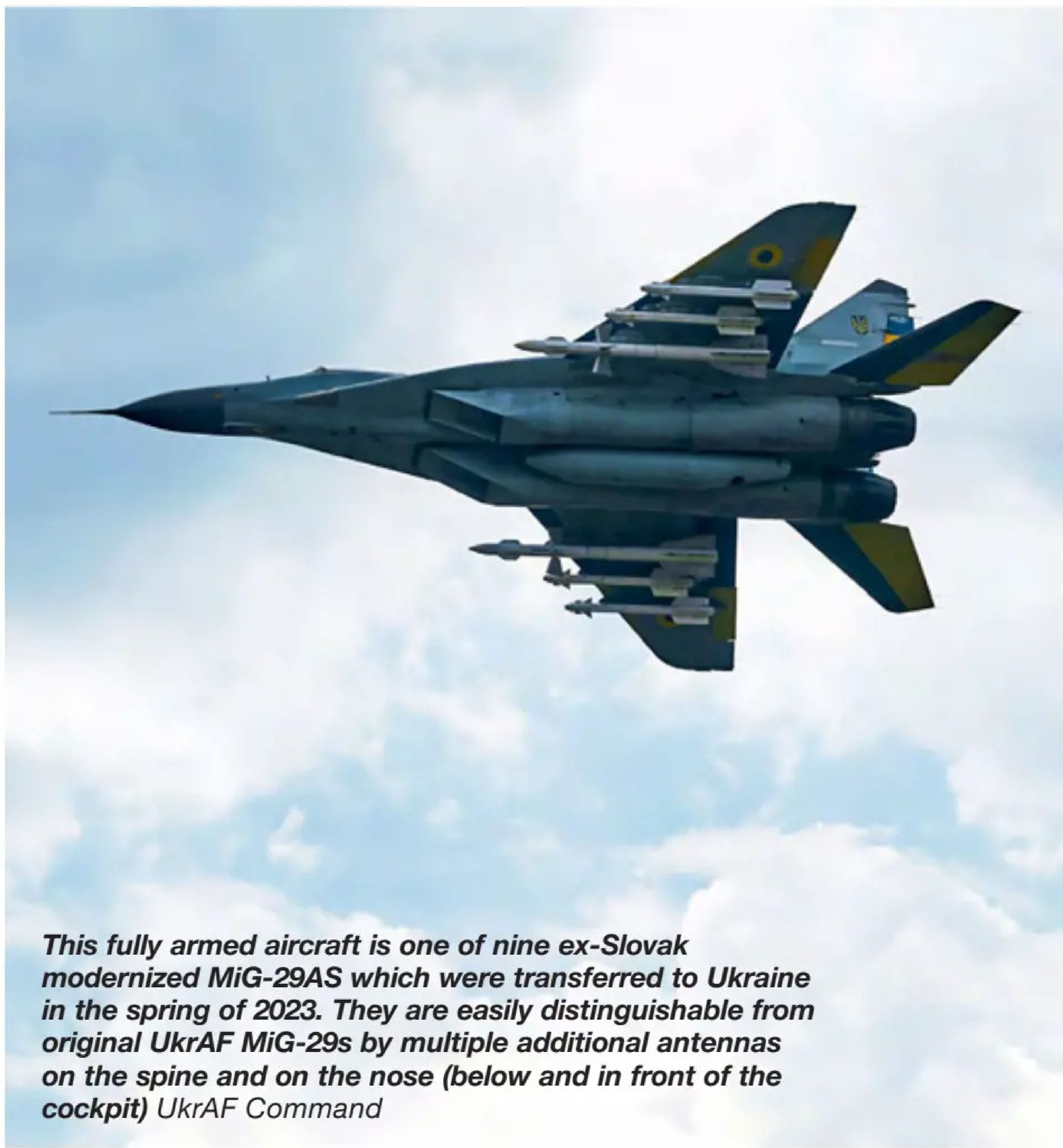
appeared in the summer of 2022. It was used to great effect during the Kherson and Kharkiv counteroffensives in 2022, putting Russian GBAD systems out of action and clearing the path for UkrAF's strike aircraft which now had the opportunity to revert to direct low-level bombing and strafing runs, as well as to deploy laser-guided AGMs.

Soon, a number of guided glide bombs were introduced – the US-built GBU-62 JDAM-ER (in February 2023), followed by the US-built GBU-39 SDB and French-built AASM-250 Hammer (both in 2024). The JDAM-ER was initially integrated with the Su-24s, but with the introduction of UK/French-built Storm Shadow/SCALP-EG ALCMs in 2023, the *Fencers* became their exclusive launch platform, leaving glide bombs to the MiG-29 and Su-27. Simultaneously, fighters were also tasked with deploying the ADM-160B Miniature Air-Launched Decoy (MALD) in support of ALCM sorties.

After depleting its stocks of large-calibre unguided air-to-ground rockets, the UkrAF in 2023 received the last remaining US stocks of 127mm Zuni rockets and associated LAU-10 pods, which were integrated on the Su-25 and used in regular standoff strikes. By early 2024 these were already depleted and the Su-25s began converting on AASM-250 Hammer bombs. Later in 2024, the delivery of US-built AGM-154 Joint Standoff Weapon (JSOW) glide bombs for use with F-16s was announced and work was underway on Ukrainian indigenous guided glide bombs.

Finally, the Soviet-era fighters are armed with two basic types of AAMs – the close-range R-73 (AA-11 *Archer*) with infra-red (IR) seeker and the BVR R-27 (AA-10 *Alamo*). The latter come in four variants – R-27R and R-27ER with semi-active radar homing (i.e. requiring the launch aircraft to track the target the entire time) and R-27T and R-27ET with an IR seeker. The R-27ER/ET are extended range variants with a larger engine and, together with the R-27T, they can be used only by the Su-27s.

The F-16s have finally brought a BVR AAM – the AIM-120B Advanced Medium-Range Air-to-Air Missile (AMRAAM), with an ARH. In addition to these, they also have at their disposal at least two variants of the IR-guided AIM-9 Sidewinder – the AIM-9M and AIM-9X, with the arrival of the German-built AIM-9L/I-1 announced in December.



This fully armed aircraft is one of nine ex-Slovak modernized MiG-29AS which were transferred to Ukraine in the spring of 2023. They are easily distinguishable from original UkrAF MiG-29s by multiple additional antennas on the spine and on the nose (below and in front of the cockpit) *UkrAF Command*

Su-27 *Flanker*

The Su-27 comes in four variants – single-seat Su-27S or Su-27P *(Flanker-B)* and two-seat Su-27UB or Su-27UP *(Flanker-C)* with identical air-to-air combat capabilities. Only the Su-27S/UB have the air-to-ground capability as the Su-27P/UP were originally built as pure interceptors for the Soviet AD force. Many of the aircraft were modernized, receiving the 1M suffix to their original designation. Wartime losses were covered from stored aircraft – many of which were pressed into service after receiving a characteristic grey camouflage scheme.

Unlike the MiG-29s, the Su-27 fleet suffered a total of only eight confirmed combat losses in the air – similarly, two of these were the result of mid-air collisions with Russian cruise missiles and/or drones (or their debris) during night-time interceptions (Su-27S '30 Blue' and '53 Blue' lost in 2023, together with their pilots).

In addition, at least four operational aircraft were destroyed with further four being damaged on the ground by Russian missile strikes in 2022. On February 24, the 39th brTA at Ozerne AB suffered two losses – Su-27P1M '37 Blue' was destroyed on its tarmac (the only known UkrAF operational combat aircraft to have been destroyed on the ground in the initial missile strikes), while Su-27P1M '39 Blue' was seriously damaged in a runway excursion (its tyre blew after hitting debris while landing, causing it to veer off runway – it was later recovered and sent to ZDARZ for repairs, but current fate remains unknown). Further losses were suffered on March 7 – three aircraft of the 39th brTA are damaged at Ozerne (Su-27S '26 Blue' and '46 Blue' plus Su-27S1M '48 Blue' – all three were later repaired in situ by ZDARZ specialists, returning to service). Finally, on July 23 three unidentified Su-27s are destroyed at Kanatove AB – two completely, plus one was damaged beyond repair.

In 2024 there were at least three instances of Russia attacking Myrhorod AB with Iskander-M SSMs – on June 10, July 1 and August 12. Apparently, Su-27s were destroyed and damaged (possibly beyond repair) on the ground, although whether any of these were operational (or real, for that matter) has yet to be determined. The total includes over five aircraft – at least one being destroyed.

Analysing UkrAF losses – a challenging task

Analysing UkrAF's combat aircraft losses during the conflict is not an easy task, especially if having to quote open sources only. Some of these – especially confirmation of an UkrAF combat aircraft pilot's death from official sources – are an almost certain indicator of a combat aircraft loss but are never a fully reliable source. It is sometimes difficult to deduce what type of aircraft was lost – or whether an aircraft was lost at all – especially in cases when the pilot in question converted on a different type of combat aircraft (for example, many retired MiG-29 pilots converted on the Su-24 and died behind its controls) or simply died of natural causes.

Good examples are the reports regarding the death of Col Yuriy Pohorilyy (a MiG-29 and Su-25 pilot) and Capt Anton Lystopad (a MiG-29 pilot, posthumously promoted to Major), occurring on August 8, 2022. Both pilots died as passengers of an UkrAF Mi-2 *Hoplite* utility helicopter – Mi-2MSB '02 Blue' of the 456th Transport Aviation Brigade (brTrA) at Havryshivka airport near Vinnytsia which crashed and burned out after colliding with a barn during a night flight at approx. 0110hrs local time. While the author was aware of this from the start through well-informed sources, this was not made public, and both losses were attributed to enemy action with the presumed loss of UkrAF combat aircraft in the process.

Also worth mentioning is that the initial Russian missile strikes in February 2022 were mostly directed against stored aircraft, so many of the aircraft destroyed on the ground in this period were decommissioned or in long-term storage for well over a decade. This is true for aircraft destroyed at the Bila Tserkva storage facility (Su-24s), at Ivano-Frankivsk AB (MiG-29s – including old MiG-29 9-12 aircraft), Lutsk AB (Su-24s), Mykolaiv-Kulbakino AB (Su-25s) and Starokostiantyniv AB (old MiG-29 9-12 aircraft and Su-24s).

The single ex-Slovak modernized two-seat MiG-29UBS, former '1303'. This aircraft is believed to be '80 White' with 114th brTA *UkrAF Command*

Left: ***The famous Maj Vadym 'Karaya' Voroshylov, a Hero of Ukraine, posing with the JDAM-ER bomb on MiG-29 type 9-13 '56 Blue' of 114th brTA before departing on a bombing mission against targets in the Kursk Oblast of Russia in late August 2024. To avoid 'friendly fire' incidents, by late 2022 most aircraft received quick recognition markings in the colours of the Ukrainian flag, while many restored aircraft were repainted in this blue-yellow paint scheme*** *UkrAF Command*

F-16 'Viper'

The F-16AM/BM Block 15 Mid-Life Update (MLU) 'Viper' is the latest and most significant addition to the UkrAF's combat aircraft fleet. The first ex-Danish aircraft arrived in July last year and were shown to the public on August 4 (for more details see *'Vipers' finally join Ukraine's war effort*, AFM October 2024, p6-7). Although this has not been officially confirmed, the first batch is believed to have had at least four aircraft (most sources quoting six) – followed by the first batch of six ex-Dutch F-16s which departed for Ukraine on the night of September 16, and a second batch of ex-Danish aircraft arriving by December 7 (presumably also containing six aircraft). This makes a total of at least 15 aircraft, ten of which are positively identified (four Danish and six Dutch single-seat F-16AMs, but some two-seat F-16BMs might have been provided as well).

This enabled the UkrAF to create its first 'Viper' squadron, but details on it – including subordination and location – remain highly classified. It is believed that it operates from various air bases located in western Ukraine, including Starokostiantyniv – home of Ukraine's Su-24 *Fencer* fleet.

Due to the lack of qualified pilots and ground crews the UkrAF is currently using it in the AD role, and – after its first setback, when it lost F-16AM '80-3600' with the pilot on August 26 (see *'Vipers' finally join Ukraine's war effort*, AFM October 2024, p6-7) – the unit scored a remarkable record. During the combined missile and 'kamikaze' drone attack on December 13, one of the pilots managed to shoot down six cruise missiles in a single sortie – four with its AAMs (two AMRAAMs and two Sidewinders), and two using the on-board 20mm M61A1 Vulcan cannon – a first for the F-16.

The cause for the August 26 loss has not been established or made public yet, but it appears that the most probable reasons include mid-air collision with a target (or its debris), or a case of 'friendly fire' (see MiG-29 and Su-27 panels for similar cases).

Above: ***The famous Lt Col Rostyslav 'Hrim' Lazarenko, a Hero of Ukraine, poses in front of Su-25 '51 Blue' – ex-Macedonian '121', returned to operational service after overhaul at ZDARZ*** *UkrAF Command*

Below: ***A modernized Su-27P1M displays a standard post-overhaul blue digital scheme with the addition of quick recognition markings in the colours of the Ukrainian flag on the rudders*** *UkrAF Command*

The single confirmed operational aircraft destroyed during the initial strikes was a Su-27 at Ozerne AB.

More lately, videos taken by Russian surveillance drones, showing Ukrainian aircraft being destroyed on the ground – usually by Lancet 'kamikaze' drones or Iskander-M (SS-26 *Stone*) hypersonic ballistic surface-to-surface missiles (SSMs) – are published. While the type in question is obvious, it is hard to determine whether it was a real operational aircraft or a decoy (a real decommissioned aircraft or an inflatable or wooden life-sized model).

Having all of the above in mind, the lists presented here contain only operational aircraft which were shot down or crashed, including cases where 'friendly fire' is suspected. While 'friendly fire' incidents are more probable along the front line, frequent use of UkrAF fighters against Russian cruise missiles and 'kamikaze' drones increases the chances for this. At least five aircraft are known to have been lost during such missions at night-time – two of them being possible 'friendly fire' victims (see F-16, MiG-29 and Su-27 panels).

Current state

At the end of January, almost three years after the war began, the UkrAF still had at least 100 active combat aircraft, estimated at 15 F-16s, 45-50 MiG-29s, 15-20 Su-24s, 15-20 Su-25s and 20-25 Su-27s. Further delivery of F-16 and Mirage 2000s are expected from a number of European countries this year, which would bring the total to the pre-war number (150). However, the greatest challenge that the UkrAF faces now is the lack of trained ground crews and pilots for its new aircraft, and this is something that needs to be taken care of as soon as possible. These are trained by partner countries and only a definite number of slots is available, so the UkrAF is considering creating its own training centre, but this would require a lot of resources (including contracted foreign trainers), and – what is most important – it will take some time before it becomes operational.

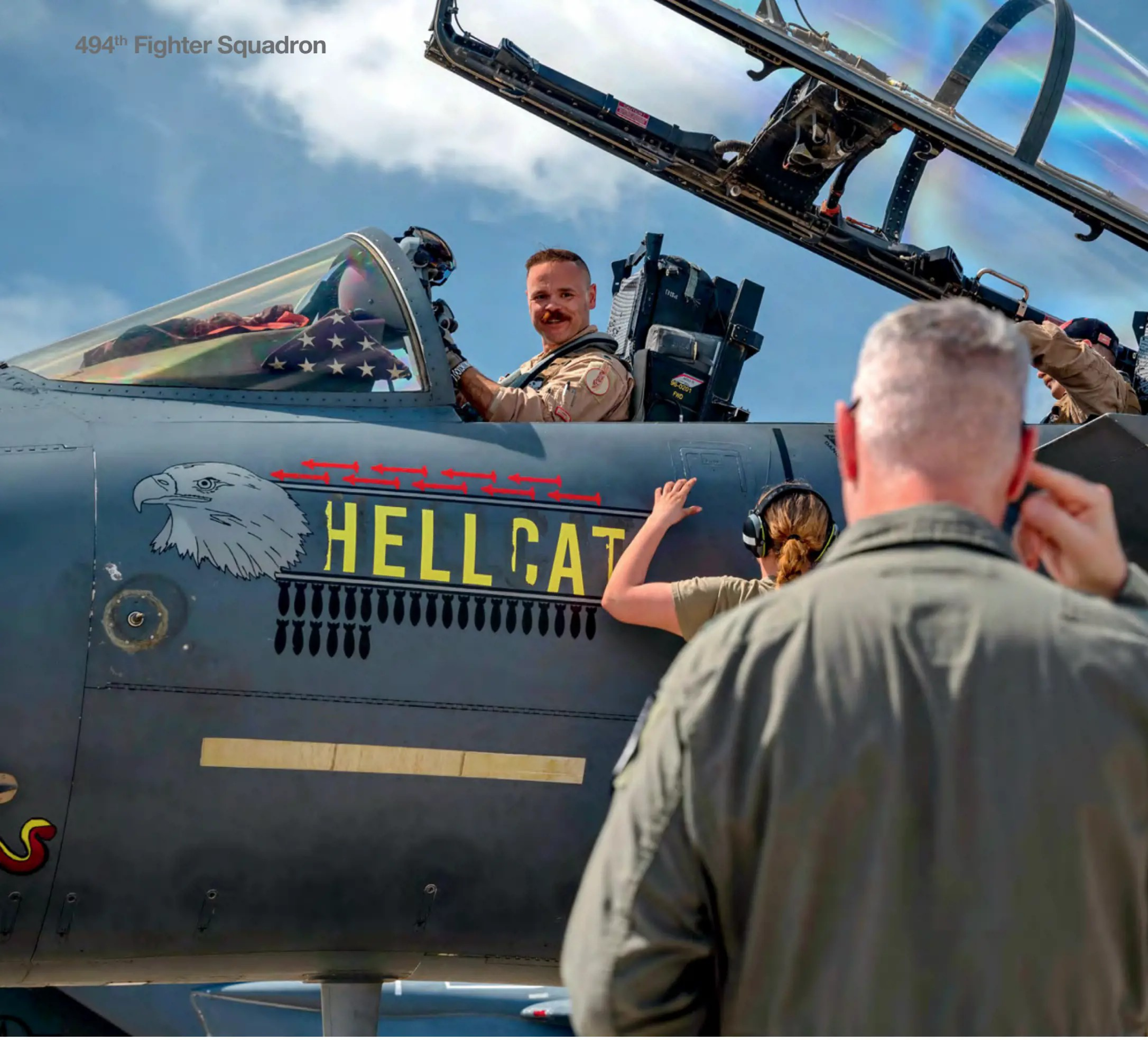
Having all of the above in mind, it is clear the ex-Soviet combat aircraft will remain in service in the foreseeable future as UkrAF's new Western aircraft have yet to reach full operational capability. **afm**

Mirage 2000

The Mirage 2000 will become the second modern Western multi-role fighter to enter UkrAF service. The donation of a yet unspecified quantity of aircraft was announced by French President Emmanuel Macron on June 6 last year, while on October 8, the French Minister of the Armed Forces, Sébastien Lecornu, stated that the first batch of aircraft will be delivered in the first quarter of 2025 – following an upgrade to their self-protection suite and adaptations enabling their use in the air-to-ground role, which would be performed at Cazaux AB. Lecornu also disclosed that UkrAF pilots and ground crews are already being trained at the Nancy-Ochey AB. By late January 2025 the six-month training course appeared to be complete, the delivery of the first batch (supposedly consisting of three aircraft) now being imminent.

Although the exact quantity and configuration remains a mystery, the aircraft are expected to be ex-French Air and Space Force Mirage 2000-5F, presumably receiving a new self-protection suite and the ability to deploy Storm Shadow/SCALP-EG ALCMs and AASM-250 Hammer glide bombs. Finally, the aircraft will be able to use MICA-RF and MICA-IR BVR AAMs, which come with ARH and IR seekers, respectively. For more see *From Paris with Hope*, on page 38.

Su-27S banks at low altitude, displaying the wartime grey scheme – usually applied on the stored aircraft restored to service since 2022. The aircraft has pylons for JDAM-ER bombs *UkrAF Command*



LAKENHEATH'S Drone Killers

The **494th Fighter Squadron** at RAF Lakenheath were responsible for shooting down 72 Iranian drones and cruise missiles that were fired at Israel on the night of April 13 last year, as Babak Taghvaee reports

The Islamic Revolutionary Guard Corps Aerospace Force (IRGCASF) conducted its first direct strike on Israel using 120 ballistic missiles, 30 cruise missiles, and over 170 drones during an operation codenamed 'True Promise-1' on April 13-14, 2024. That night saw tens of fighters from the air forces of Israel, France, UK and the United States shoot down almost all of the drones and cruise missiles over Iraq and Jordan.

Among them were 21 F-15Es from the USAF's 335th Fighter Squadron 'Chiefs' based at Seymour Johnson AFB, North Carolina and the 494th Fighter Squadron 'Panthers' which were responsible for most

USAF Brig Gen Joseph Campo, 48th Fighter Wing commander, welcomes the returning 494th Fighter Squadron at RAF Lakenheath, Suffolk, on May 8, 2024. The F-15E in this image is 'Hellcat' - 96-0201 *USAF/SAmn Seleena Muhammad-Ali*

A group of four F-15Es of the 494th EFS after their redeployment at RAF Lakenheath *USAF/SAmn Renee Nicole Finona*

of the kills. The stories of the work the aircrew did that night remained secret until November 12, 2024, when personnel of the 494th Expeditionary Fighter Squadron (EFS) were awarded medals of honour by the USAF Europe commander, General James Hecker, at their home base, RAF Lakenheath. Just a few days after that, their base became the target of mysterious drone overflights.

F-15E, the USAF's best drone killer

The US Government had been notified in advance of Iran's intended attack, and the allied fighters were ready to confront the Iranian One-Way Attack (OWA) drones and cruise missiles.

The US-led coalition fighter jets participating in the combat air patrols over Iraq, Jordan, and Saudi Arabia, included 21 F-15Es flown from Muwaffaq Salti Air Base in Jordan. They were made up of 11 from the 335th FS and ten from the 494th FS (12 had been on deployment there since October 13 and 16, 2023), that claimed the highest number of kills that night. Just a day before Iranian attack, the 335th FS had deployed 12 F-15Es to Muwaffaq with a refuelling stop in RAF Lakenheath.

Each of the F-15Es were armed with four AIM-9X Sidewinder infrared-guided short-range air-to-air missiles and four AIM-120D AMRAAMs (Advanced Medium-Range Air-to-Air Missiles). Additionally, each aircraft's General Electric M61A1 cannon was loaded with 500 20mm rounds while an AA/AAQ-14 LANTIRN Navigation pod and an AN/AAQ-33 Sniper targeting pod were also installed.

The 494th FS had a share of 72 drone-missile kills that night (around half are confirmed), while the 335th FS, despite arriving in Jordan just a day earlier, scored 92 kills, with more than half confirmed! Lt Col Timothy Causey, commander of the 494th FS, said: "I am extremely proud, extremely proud to be a panther in both the fighter squadron and the FGS [Fighter Generation Squadron]. Three-hundred weapons were fired [by the IRGCASF] at a target band. Six of them hit [Israel], but no one died."

Awarding personnel of the 494th FS

During a ceremony at RAF Lakenheath on November 12, 2024, the USAFE awarded air and ground crew of the 494th Expeditionary Fighter Squadron (EFS) for their epic night's work. This historical achievement brought a direct call from President Joe Biden to the deployed team, lauding their exceptional airmanship and skill. Hecker, US Air Forces in Europe – Air Forces Africa commander,

'Strafe' - 91-0310, an F-15E of the 494th EFS taxies to a parking area at RAF Lakenheath after returning from Jordan *USAF/SAmn Renee Nicole Finona*

'Mullet', an F-15E of the 494th EFS, serial no 91-0313 shot-down nine Iranian OWA drones and LACMs using AIM-9Xs, AIM-120Ds and M61 Vulcan cannon *USAF/SSgt Devin Rumbaugh*

Above Left: ***US Air Force Commander, Europe and Africa, Gen James Hecker, presents the Distinguished Flying Cross to Lt Col Timothy Causey, 494th Fighter Squadron commander, during the ceremony at RAF Lakenheath*** *USAF/SAmn Seleena Muhammad-Ali*

Above Right: ***Captain Austin Leake of 494th Fighter Squadron receives the Distinguished Flying Cross with 'C' Device US Air Force from Gen James Hecker during the ceremony at RAF Lakenheath*** *USAF/SAmn Seleena Muhammad-Ali*

'Anubis' - 87-0193, assigned to the 335th EFS, home-based at Seymour Johnson Air Force Base is seen here over Syria on August 28, 2024. This jet shot down nine Iranian drones and missiles on April 13-14. USAF

presided over the ceremony along with Col Jack Arthaud, 48th FW commander.

During the ceremony, 48th FW commander and personnel of 494th FS were awarded two Silver Stars, six Distinguished Flying Crosses with valour, four Distinguished Flying Crosses with the combat device, four Distinguished Flying Crosses, two Bronze Stars, seven Air and Space Commendation Medals and seven Air and Space Achievement Medals.

"Our airmen stood firm alongside our coalition partners to protect Israel from a barrage of one-way attack unmanned aerial vehicles and missiles," said Hecker. "The success of our airmen demonstrates how the US Air Force is ready to respond to, and defeat, evolving threats."

494th FS commander Causey said his team's success was due to their ability to remain focused and carry out what they've been trained to do. "We all fell into an execution rhythm: call, shoot, and confirm the target was destroyed before we moved on to the next task we had to accomplish to keep everyone safe."

The highest level of decoration awarded during the ceremony, the Silver Star, was presented to F-15E instructor pilot, Maj Benjamin Coffey, and F-15E instructor weapon systems officer, Capt Lacie Hester who scored 13 kills onboard F-15E, 'Red Tail Angel' (91-0334). The Silver Star is the United States Armed Forces third-highest military decoration for valour in combat. The Silver Stars were presented based on the aircrew's gallantry in action repelling the Iranian attack as the airborne mission commanders directed coalition forces during the unprecedented large-scale attack against Israel.

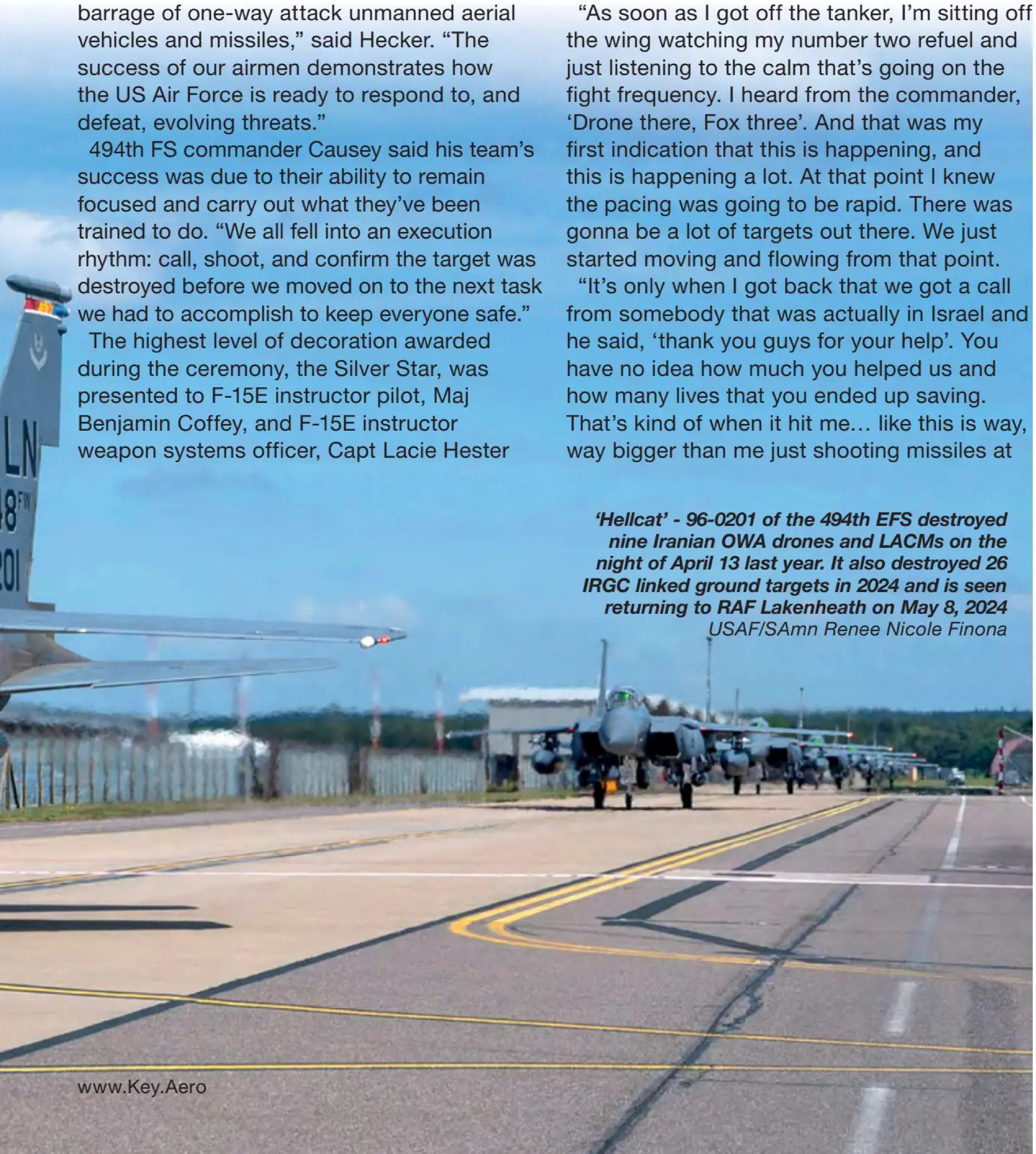
"It takes a high performing team with high performing individuals to be able to find these things to begin with, and then to engage it," said Coffey. He went on to express the challenges the mission presented and how the teams worked in tandem. "We have the pilots working the air-to-air radar, [to] make sure they don't hit the ground, they don't hit their element leads and [we're] employing and we start to get another data point and another data point and another data point."

Hester is also the first woman in the Air Force to receive the Silver Star and only the tenth woman in the Dept of Defense to receive the prestigious decoration.

F-15E pilot Capt Austin Leake, who received Distinguished Flying Cross with 'C' Device on November 12, was among the F-15E pilots of 494th FS who flew a mission in Jordan on the night of April 13-14: "I was seeing flaming balls of debris from space that were falling at points I can only estimate 15 to 20 miles in front of the jet. That happened fast and then I see another one on the horizon, another orange dot. And then that burns out. Then, all of a sudden, the sky is lighting up with these orange boosters on the horizon. I hear the call from the back seat. He goes, "dude, look up."

"As soon as I got off the tanker, I'm sitting off the wing watching my number two refuel and just listening to the calm that's going on the fight frequency. I heard from the commander, 'Drone there, Fox three'. And that was my first indication that this is happening, and this is happening a lot. At that point I knew the pacing was going to be rapid. There was gonna be a lot of targets out there. We just started moving and flowing from that point.

"It's only when I got back that we got a call from somebody that was actually in Israel and he said, 'thank you guys for your help'. You have no idea how much you helped us and how many lives that you ended up saving. That's kind of when it hit me… like this is way, way bigger than me just shooting missiles at



'Hellcat' - 96-0201 of the 494th EFS destroyed nine Iranian OWA drones and LACMs on the night of April 13 last year. It also destroyed 26 IRGC linked ground targets in 2024 and is seen returning to RAF Lakenheath on May 8, 2024 USAF/SAmn Renee Nicole Finona

Drone overflights at RAF Lakenheath

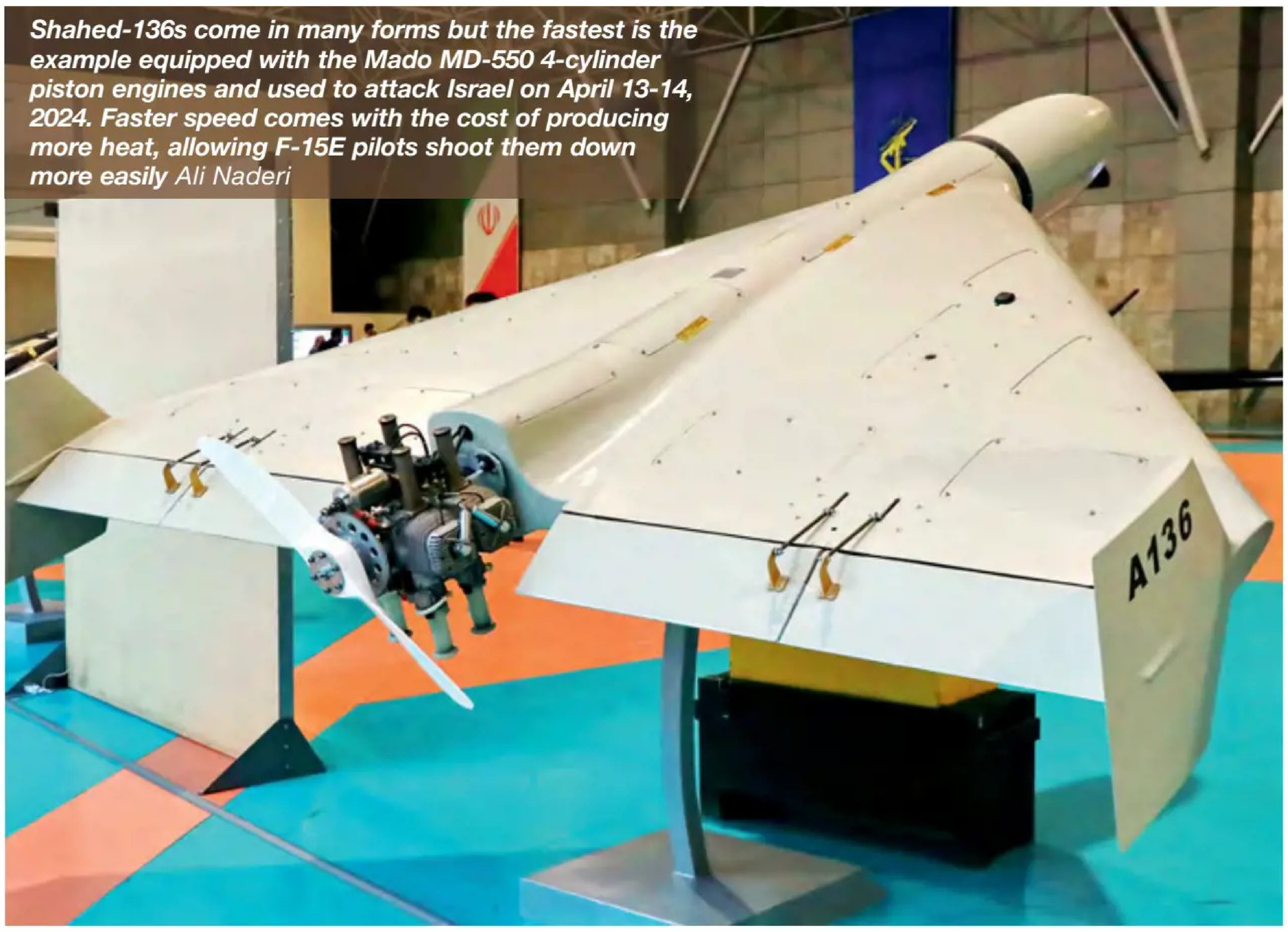
Just eight days after personnel of the 494th FS were awarded by the USAFE commander on the order of US President Biden, RAF Lakenheath began seeing overflights of drones that could pose a risk to the safety and security of the service personnel, their families, and the fighter jets of the 48th FW. These flights resulted in the QRA of two F-15E Strike Eagles of the 494th FS, armed with Sidewinders and AMRAAMs on the first day. The news about the incident was leaked to the media on November 23.

The author was informed by an Israeli diplomatic source that these drones might have been operated by groups with possible ties to the Iranian regime (IRGC) in response to actions of the 494th FS in Jordan on April 13-14. While the UK police have not yet found the perpetrators, the USAFE told the author that they are unable to verify the claims of the Israeli government sources about these drones as the investigations were still ongoing as of November 28, 2024, when the last update on the incident was given to the author. On November 26, 2024, the USAFE Public Affairs told the author: "Small unmanned aerial systems continue to be spotted in the vicinity of and over RAF Lakenheath, RAF Mildenhall, RAF Feltwell and RAF Fairford since November 20. To date, installation leaders have determined that none of the incursions impacted base residents, facilities or assets.

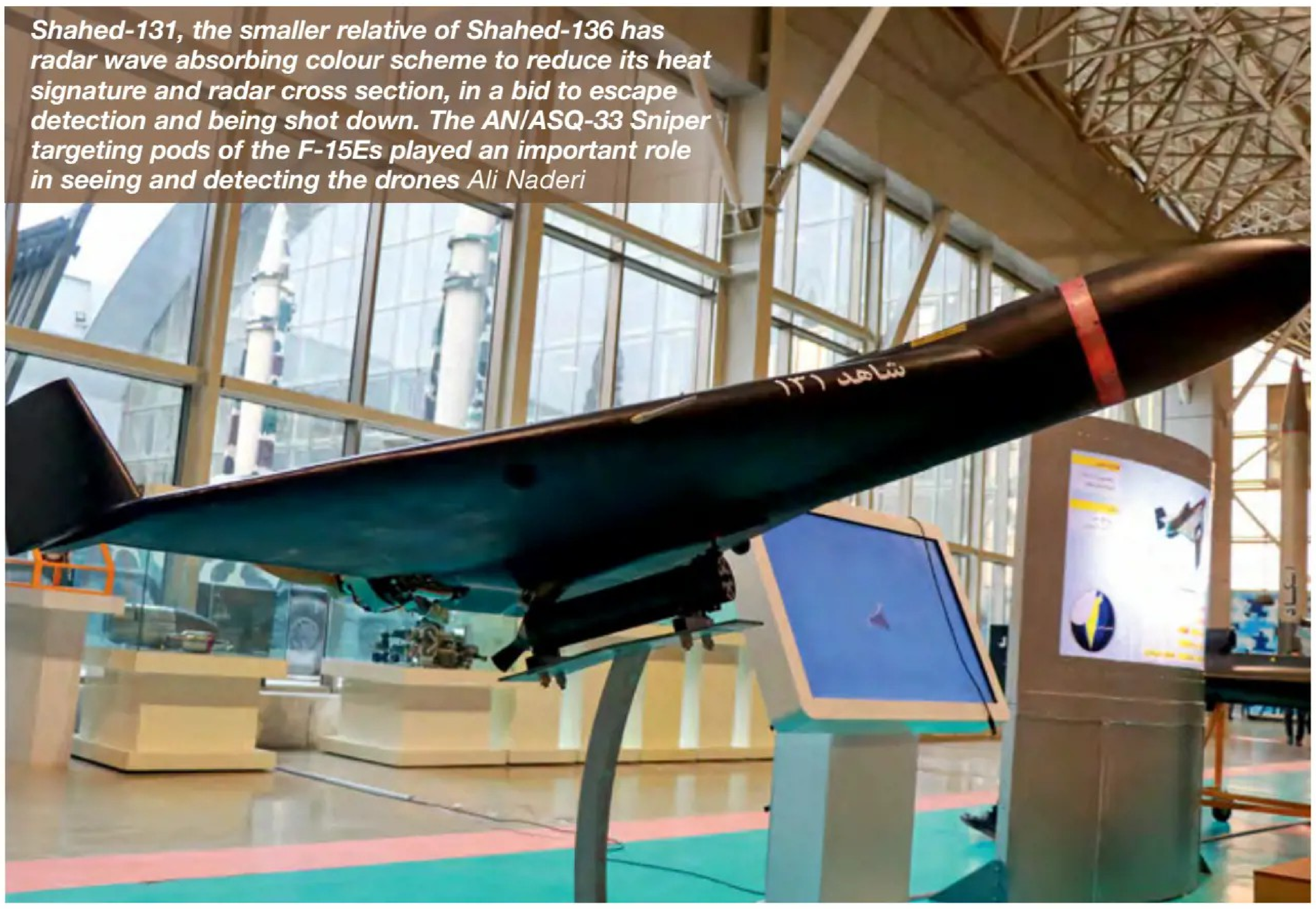
"The Air Force is taking all appropriate measures to safeguard the aforementioned installations and their residents. The number of systems has fluctuated, and they have ranged in sizes and configurations. Our units continue to monitor the airspace and are working with host-nation authorities and mission partners to ensure the safety of base personnel, facilities and assets.

On November 26, 2024, Pentagon Press Secretary Air Force Maj Gen Pat Ryder held a Press Briefing in Washington DC during which he explained: "What I would tell you is that they [the drones] are being actively monitored. Installation leaders have determined so far that none of these incursions impact the base residents, the facilities, or the assets that we have on those bases. We're, of course, continuing to work with host nation authorities and our mission partners to ensure the safety of our personnel, our facilities, and the equipment."

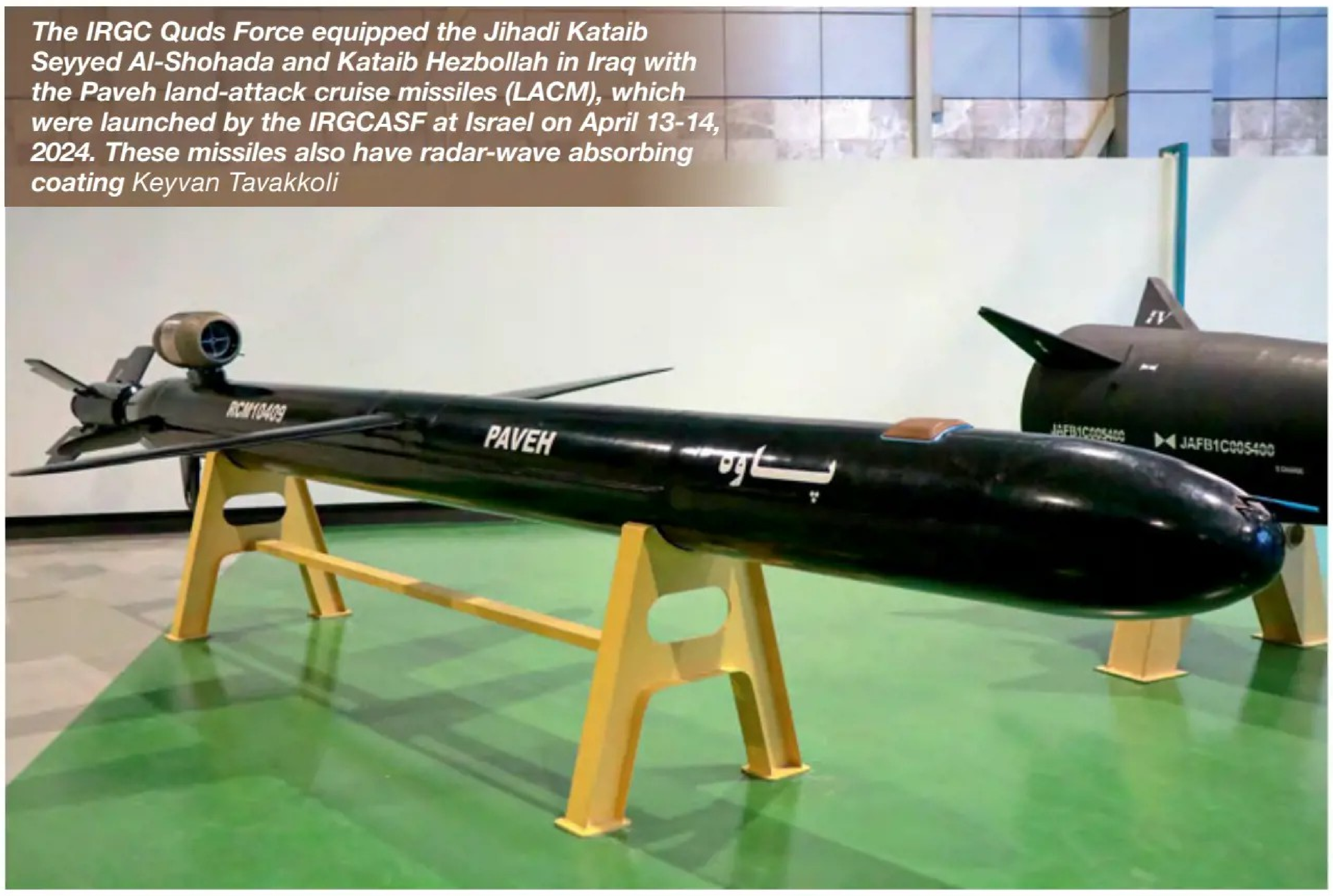
As the overflights of drones over RAF Lakenheath continued, the 494th FS held a combat air patrol over Norwich during Thanksgiving on November 28, 2024. This was carried out by two F-15Es, each armed with four AIM-9Xs and four AIM-120C/Ds flying at 20,000ft. A KC-135R of the 351st ARS, 100th ARW flown from RAF Mildenhall (57-2605) refuelled them. The tanker left its base at around 1610hrs local time and returned at around 1940hrs local time. During its flight over Norwich, it maintained an altitude of 21,000ft and refuelled the pair of F-15Es twice, allowing them to stay airborne until around 2200hrs local time.



Shahed-136s come in many forms but the fastest is the example equipped with the Mado MD-550 4-cylinder piston engines and used to attack Israel on April 13-14, 2024. Faster speed comes with the cost of producing more heat, allowing F-15E pilots shoot them down more easily Ali Naderi



Shahed-131, the smaller relative of Shahed-136 has radar wave absorbing colour scheme to reduce its heat signature and radar cross section, in a bid to escape detection and being shot down. The AN/ASQ-33 Sniper targeting pods of the F-15Es played an important role in seeing and detecting the drones Ali Naderi



The IRGC Quds Force equipped the Jihadi Kataib Seyyed Al-Shohada and Kataib Hezbollah in Iraq with the Paveh land-attack cruise missiles (LACM), which were launched by the IRGCASF at Israel on April 13-14, 2024. These missiles also have radar-wave absorbing coating Keyvan Tavakkoli

High flying F-15E 89-0487 named 'Lucky' of the 4th Fighter Wing's 335th FS suitably inscribed 15,000 to denote the milestone number of hours the jet has flown in almost 35 years of service. The 335th arrived at Muwaffaq in early April to take over from the 494th FS which ended up staying to support the April 13-14 operation. The 335th left for Seymour Johnson in November, having been replaced by RAF Lakenheath's 492nd FS. 'Lucky' is seen here overflying Jordan during its stay in country US Air Force

A short turn for the Madhatters

On October 26, 2024, the IASF conducted a retaliatory strike on Iranian air defence, missile production, and nuclear sites during an operation code-named 'Days of Repentance'. Almost 50 fighter jets were used to launch Golden Horizon and other air-launched ballistic missiles (ALBMs). The Iranian Islamic Regime threatened to retaliate against this Israeli airstrike. To protect Israeli and US troops in the CENTCOM's AOR during that operation, AFCENT significantly increased its defence posture in the region, including the deployment of 12 F-15Es from the 492nd FS 'Madhatters' on November 7, 2024.

During its 70 days of presence, the 492nd EFS collaborated with their counterparts in the 335th FS to conduct tens of airstrikes on IRGC-backed PMU (Popular Mobilization Units) in the Deir Ez-Zor governorate of Syria. On December 8, 2024, when Turkish-backed Islamist groups took power in Damascus, F-15Es from the squadron flew over central Syria and destroyed multiple ISIS targets. The 'Madhatters' targeted two newly established training camps and three convoys of terrorists on December 8 and in the days following.

With the fall of Assad's regime in Syria, the subsequent withdrawal of the IRGC Quds Force and its proxies from Syria, and the availability of six B-52H Strategic bombers from the USAF's 69th Bomb Squadron at Al-Udeid AB, Qatar, the need for 24 F-15Es at Muwaffaq was reduced to 12. Subsequently, on December 17 and 19, the 12 F-15Es of the 492nd EFS were flown back to RAF Lakenheath with aerial refuelling support provided by KC-46A Pegasus heavy tankers.

Like the F-15Es of the 494th EFS, the aircraft used by the 492nd EFS in Muwaffaq were given names, nose art, and kill marks. The first six that returned on December 17 were named after Greek gods/mythology as were the second six: 'Hephaestus' - 91-0302, 'Aphrodite' - 91-0315, 'Kratos' - 91-0316, 'Thanatos' - 96-0202, 'Hermes' - 97-0219, and 'Hades' 97-0222. Among these, 'Hades' sported kill marks that indicated the use of two AIM-9X Sidewinders, three GBU-39/B Small Diameter Bombs, and four GBU-38/54 Joint Direct Attack Munition/Laser Joint Direct Attack Munition (JDAM/LJDAM) bombs. The second six jets which returned to RAF Lakenheath on December 19, 2024, were named 'Kronos' - 91-0301 'Prometheus' - 91-0331, 'Poseidon' - 97-0218, 'Athena' – 97-0220, 'Zeus' - 97-0221, 'Ares' - 98-0134.

drones. This is the defence of our coalition partners."

Causey flew a mission that night and received a Distinguished Flying Cross. He said about that mission: "I would just say 'drone there' and then shoot the missile. It would come off the rail, drone destroyed, [then onto] the next eight engagements.

"We started to see Vipers [F-16CM Block 40s of 511th FS] down south executing and we're like, 'oh this, this is happening, right, and we are now going to start engaging' and then at that point it's just focus. We just kind of took one at a time. 'Hey, I have a lock. Nobody else is locked to that thing. This is what I'm going to execute. Take a shot, and then the next one and we just kind of marched through that execution rhythm; we really got into a rhythm."

That evening the 494th FGS, represented by 66 airmen, launched 14 F-15E sorties including scrambling six alert aircraft amid a backdrop of active base defences, destroying enemy targets overhead. "People, mission. People, mission – that's all that was in my head," said MSgt Timothy Adams, lead production superintendent for the 494th FGS that evening. "People first, keep them safe. Make sure they're doing what they need to do and are safe. I was just focused on everything going around. I didn't have time to stop and look up." **afm**

'Hephaestus' – 91-0302, an F-15E of the 492nd EFS returned to RAF Lakenheath on December 17, 2024, with five other Strike Eagles, after almost 70 days of being deployed to Muwaffaq. During its time in Jordan, the aircraft shot down at least two Iranian drones. Note the camel souvenir in the front cockpit window
Mark Rourke

Seeing the year

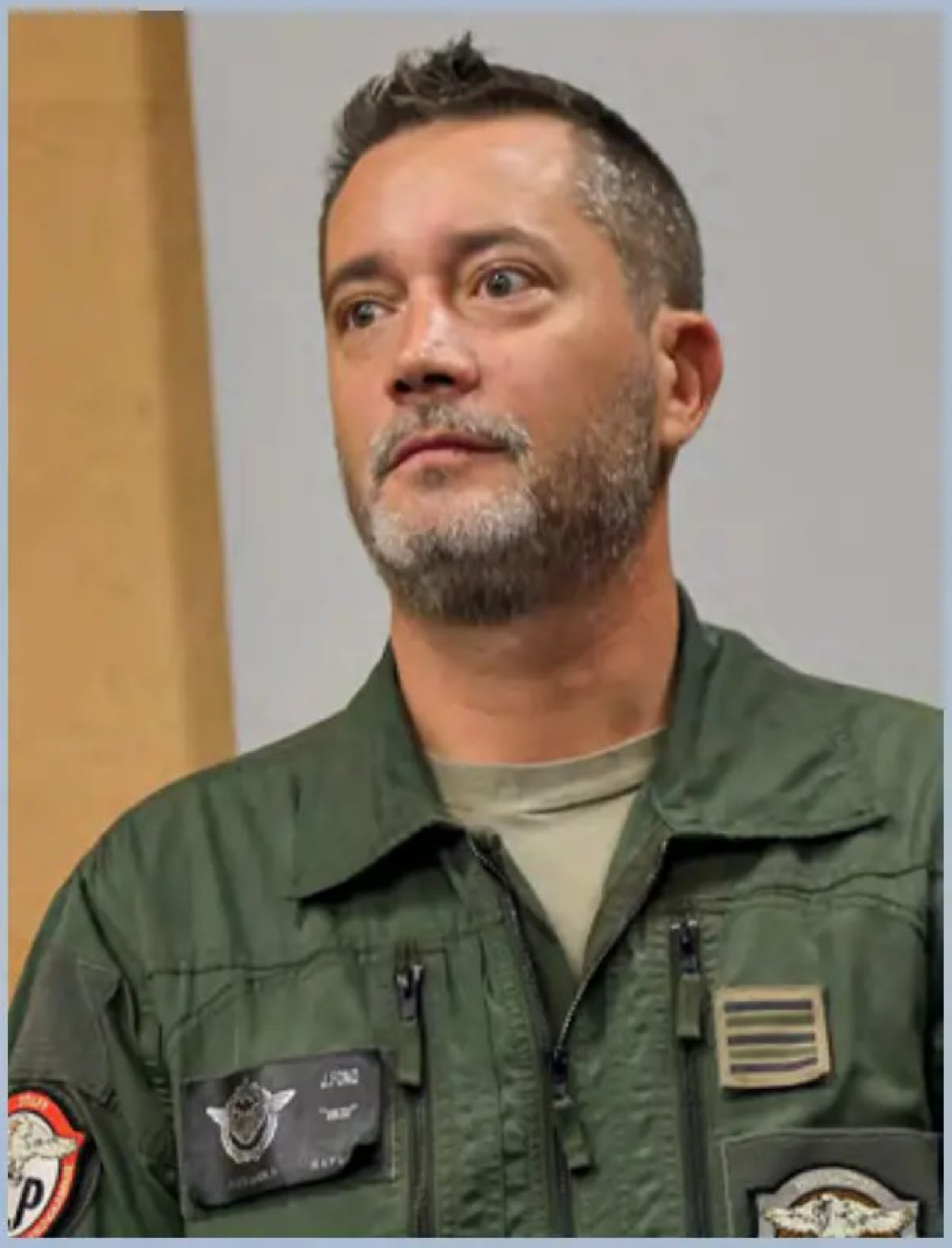
Peter ten Berg visits the last Tactical Leadership Programme exercise of 2024

Late 2024 saw the final TLP flying course of the year taking place, as usual, at Base Aérea de Albacete – Los Llanos in Spain. Flying Course (FC) 2024-4 edition, saw six NATO members present with a variety of aircraft, although the 25 Eurofighter Typhoons were the most dominant asset. Italian F-35As and Greek Rafale EGs were newcomers, while the newly upgraded French Mirage 2000D RMVs were also present.

FC 2024-4

The course, now in its 15th year in Spain, started on November 29· The 'Blue' forces were made up of 22 aircraft including Eurofighters, Tornado IDS, F-35As, Mirage 2000D-RMV, Typhoons and Rafale EGs. While the 'Red' (opposing) forces flew ten aircraft from a selection of Eurofighters, Typhoons, Mirage 2000D-RMV and Rafale EGs. Participating air forces also brought additional airframes for back-up. Air support assets included a Spanish Airbus C-295 for tactical transport, a civil Learjet 35 for radar jamming, a NATO E-3A AWACS for Command and Control and a Spanish MQ-9A RPAS. For helicopter duties like Search and Rescue, France detached an EC-725 Caracal and Italy sent two HH-101 helicopters.

New to TLP were the Rafale EGs of the Hellenic Air Force from 332 Squadron at Tanagra. Another first show at TLP were the F-35As Lightning IIs from 32 Stormo/13 Gruppo based at Amendola, Italy and while French Mirage 2000Ds have been at TLP many times before, the RMV variants were rather new. These are Mirage 2000Ds from Nancy-Ochey air base that are currently undergoing a Mid Life Upgrade program,



The last TLP course of 2024 saw three newcomers, including this Hellenic Rafale EG of 332 Mira 'Hawk' based at Tanagra

out

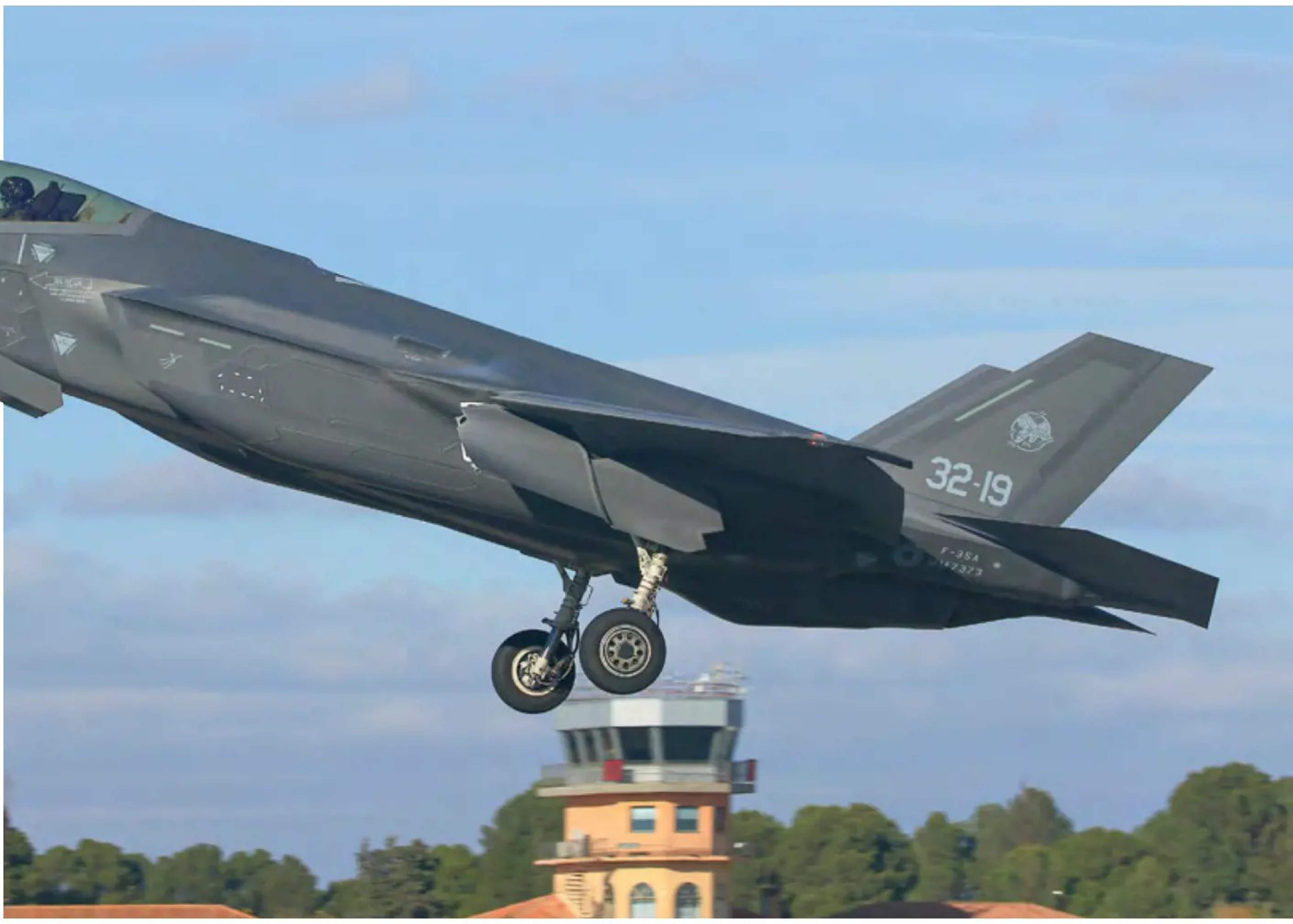
named in French as Rénovation Mi-Vie. Lt Col Fond, the TLP Flying Branch Chief and a French Air and Space Force Rafale pilot, explained that every time a new aircraft type or weapon system is introduced to the TLP, the course syllabus is adjusted, and new mission scenarios are developed. Information arising out of a conflict like Ukraine, will then be included in new TLP scenarios. This way the TLP course remains relevant, on top of the latest operational developments and able to adjust the scenarios to keep the course as realistic and challenging as possible. “For the F-35 you can think of its extended flight range, so making scenarios with a larger range possible, or making use of all information obtained by its powerful sensors for other aircraft,” Fond explained.

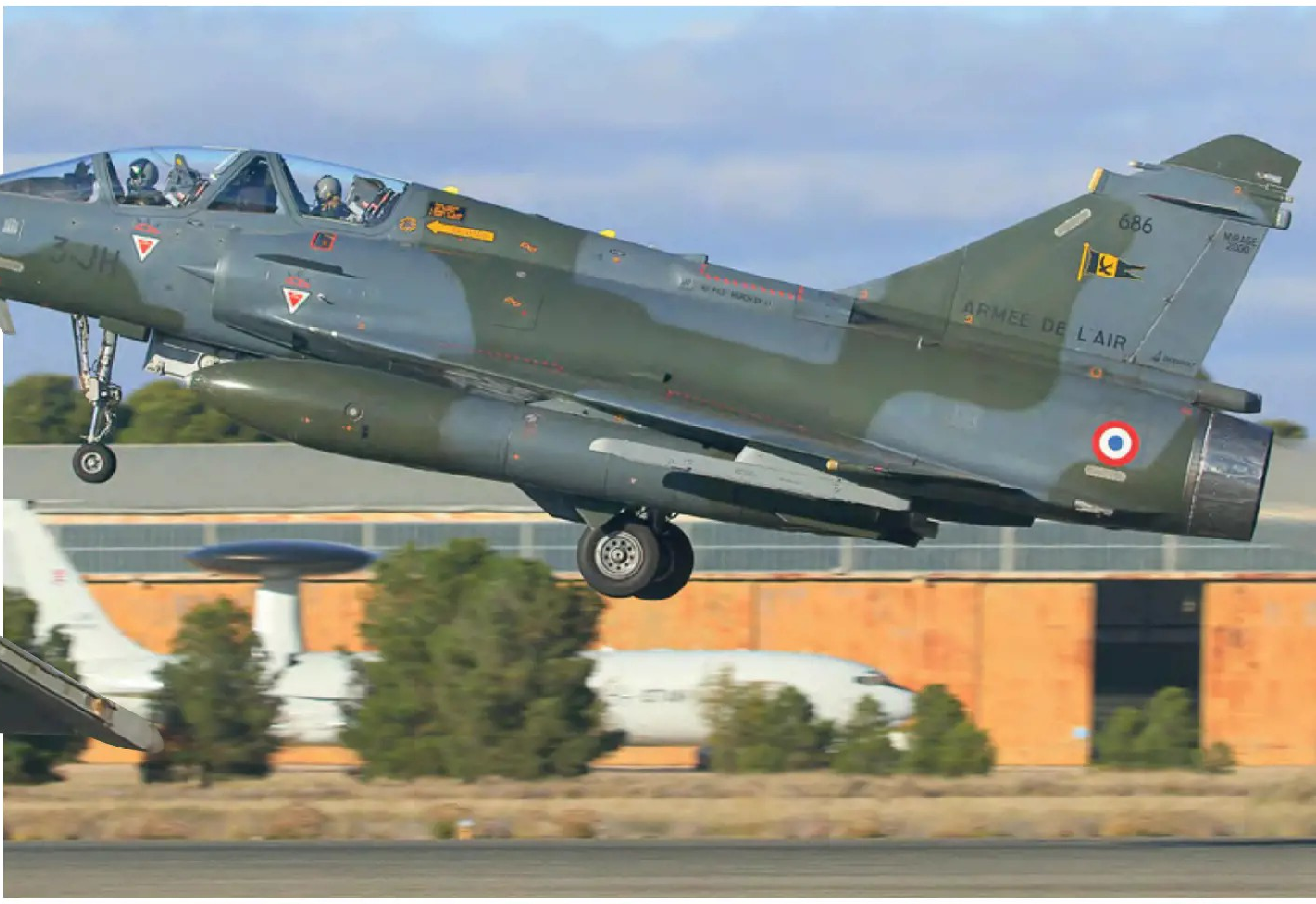
Four new TLP flying courses have been planned for 2025, with the first edition starting on January 23. **afm**

Left: ***TLP Flying Branch Chief Lt Col ‘Skid’ Fond of the French Airand Space Force is a Rafale pilot***

Right: ***FC 2024-4 was the TLP premiere for the Italian Air Force F-35As from 32° Stormo at Amendola***

Below Right: ***The French Air and Space Force sent newly upgraded Mirage 2000D-RMVs from Nancy-Ochey for the first time to a TLP***





Latest member - Portugal

From last month (January 2025), the list of ten TLP MOU countries grew to 11, as Portugal formally joined the organisation. This means that Portugal will also be entitled to send students to the future planned courses, as well as provide staff, such as experienced instructors, to the organisation.

TRAINING turns to reality

Marco Muntz and **Marnix Sap** were in Italy last autumn to see many of the country's SAR assets working together in the annual exercise that ended prematurely because of a real SAR effort

With the head of the Rescue Co-ordination Centre and Exercise director Colonel Zanetti in the foreground, participants of Grifone 2024 pose on the flightline at Lucca-Tassignano airport

GRIFONE 2024
LUCCA

The AW139 is now widely used by Italy's armed forces and law enforcement agencies with the Polizia di Stato sending a UH-139E from Florence Peretola-based 8° Reparto Volo to Grifone 2024

In the third week of September last year, the 2024 edition of the international Search and Rescue (SAR) exercise took place in Tuscany. The largest of its kind to be held in Italy, each year Grifone is organised in a different region to offer SAR assets throughout the country the opportunity to train together. Capannori airport, located just three miles (5km) east of the medieval city of Lucca, served as the forward operating base, with the Apuan Alps mountain range chosen as the exercise area. Unfortunately, adverse weather conditions and the sudden disappearance of a four-seat Yak-18T in the vicinity resulted in the premature ending of the exercise. Grifone then transformed into a real SAR event with several of the exercise participants tasked to search for the missing French aircraft.

Multiple agreements

The Grifone exercise is planned and executed by the Aeronautica Militare (AM, Italian Air Force) through the Rescue Co-ordination Centre (RCC) of the Comando Operazioni Aerospaziali (COA), based in Poggio Renatico, Ferrara province, and has its origin based upon two agreements. The international agreement SAR Mediterraneo Occidentale (SAR MED.OCC.) was signed in 1978 between Italy, France and Spain with the objective to support each other in aerial search and rescue operations, both on land and at sea. The SAR MED.OCC. agreement encourages all participating countries to train together at least once a year with the objective of enhancing both co-ordination and collaboration. The second agreement is between the Stato Maggiore Difesa (Italian Ministry of Defence) and the Corpo Nazionale Soccorso Alpino e Speleologico (CNSAS, National Alpine Rescue Corps) to organize and conduct rescue operations while working together in case of an aircraft accident. In such an emergency, Italian Armed Forces are responsible for all support in the air, mainly helicopters, while the CNSAS has sections all over Italy and contributes with manpower and equipment. Also, the Guardia Costiera (Coast Guard) and Italian law enforcement agencies such as the Guardia di Finanza (Customs Police), Carabinieri (Military Police) and Polizia di Stato (National Police) can be called upon to assist in an emergency situation.

Organising rescue operations

Taking into account its size and complexity, planning of Grifone typically starts more than six months before the actual exercise. In July 2023, Grifone was held at Frosinone in the Lazio region near Rome and for the 2024 edition, a vast area of the Apuan Alps, covering approximately 1100sq miles (2,750sq km), was assigned as operating zone for the exercise. The civil airport of Lucca-Tassignano was designated as Deployed Operating Base (DOB) and would be used to set up a Forward Operating Base or Posto Base Avanzato (PBA). The PBA is a temporary, well-equipped heliport close to the area of operation to minimize flight times to the area of operation using all assets in the most efficient way possible. As a result, precious time can be saved, which is a decisive factor in the successful outcome of a rescue mission.

The Comando Logistico dell'AM (Italian Air Force Logistic Command) is responsible for all operational support. Verona-Villafranca based 3° Stormo, assisted by the 1° Reparto Tecnico Comunicazioni di Linate, provided personnel, equipment and infrastructure to establish a fully autonomous heliport. This included fuel, fire services, air traffic control, weather service, an operations room and crew to direct helicopter ground manoeuvres and assist in disembarking the rescue teams. Ground equipment included a temporary hospital, ambulance vehicles, a field kitchen, generators, sanitary facilities, tents and corresponding furniture.

During operations at such a remote heliport, a dedicated team from the RCC is responsible for command, control and co-ordination of all flying assets. The CNSAS manages the units on the ground, including all rescue and medical assistance teams, irrespective of whether civilian or military. The Soccorso Alpino e Speleologico Toscano (SAST) participated with approximately 100 specialists including 20 rescue teams, one medical team and two search dog teams (squadre cinofine). The composition of such a

Familiar with the exercise area of the Apuan Alps, the 4° Nucleo Elicotteri from nearby Pisa-San Giusto deployed one of only three UH-139Ds operated by the Carabinieri, to Lucca. It is seen here dropping off a CNSAS rescue team in the mountains of the Apuan Alps

rescue team depends on the purpose of the mission and skills of each individual rescuer.

Under the supervision of exercise director Colonel Zanetti, some 400 men and women participated in the 16th edition of Grifone, all with one common objective: to train together to save lives by simulating complex, realistic scenarios.

Rotary assets

For this year's edition, a total of ten helicopters deployed to Lucca-Tassignano airport to participate. Helicopter units represented all three branches of the Italian Armed Forces, three law enforcement agencies, the Guardia Costiera (Coast Guard) and Ejército del Aire y del Espacio (Spanish Air and Space Force). The Aeronautica Militare was present with one HH-139B and two TH-500Bs. The HH-139B, flying under callsign Speedy01, arrived from Decimomannu, Sardinia, where it is assigned to 80° Centro SAR. The two TH-500s were drawn from two different units, Frosinone based 208° Gruppo and the Squadriglia Collegamento di Linate. Alongside a single SIAI-Marchetti U-208A, the Milan-Linate-based liaison unit operates only one TH-500B which had just been assigned after major overhaul.

The largest helicopter to participate was a 1° Grupelicot EH-101 of the Marina Militare from nearby Sarzana-Luni, sending two different airframes for the familiarisation period and the actual exercise. Operating from naval base of Sarzana-Luni is the Guardia Costiera sending one of their PH-139C from the 1ª Sezione Volo Elicotteri. The Esercito Italiano (Italian

By far the largest helicopter to participate in Grifone 2024 was a MH-101A operated by 1° Grupelicot at Sarzana-Luni, that can transport a maximum of 35 fully equipped rescuers

A total of 60 UH-90A tactical transport helicopters have been delivered to three different Italian Army regiments including 5° Reggimento at Casarza della Delizia in northeastern Italy. A wide range of missions are flown including MEDEVAC and hoist operations.Unfortunately, the latter could not be trained due to adverse weather conditions in the exercise area

Army) dispatched a single UH-90A operated by 27° Gruppo Squadroni 'Mercurio', based at Casarsa della Delizia located some (100km) northeast of Venice.

A standard participant of the exercise, the Guardia di Finanza, a militarized police force of the Ministry of Economy and Finance, sent one of their MH-169A Light Utility Helicopters (LUH) from nearby Pisa–San Giusto to Lucca. With the Guardia di Finanza being the launch customer of the skids-equipped AW169M variant, the Sezione Aerea di Pisa received two MH-169As in March 2023, replacing the venerable AB-412s which had been in service with the unit for 20 years. It was the second time the Guardia di Finanza had participated with their new MH-169A, making its debut during 2023's Grifone exercise at Frosinone. The Carabinieri (national gendarmerie of Italy), deployed one of only three UH-139Ds to Lucca. Operated by the 4° Nucleo Elicotteri, it also flew in from nearby Pisa-San Giusto. The Polizia di Stato participated with an UH-139E from Florence-based 8° Reparto Volo.

Foreign participation came from the Spanish Air and Space Force 801 Escuadrón SAR. A single Sikorsky S-76C was flown in from Mallorca, the largest of the Balearic Islands. Operated by 801 Escuadrón of Ala 49 (49th Wing), the unit bid farewell to the AS332B (HD-21) Super Puma on July 19, 2024, and a total of eight S-76C will be transferred from Granada Armilla's Ala 78, which is being re-equipped with 11 brand new Airbus H135s. This particular helicopter had only been transferred to Mallorca-Son San Juan air base

801 Squadron is now operating former Sikorsky S-76C (HD.24) training helicopters of Ala 78, for SAR. The skills of the Spanish aircrew were called upon, when the exercise turned into a real-life rescue event joining the search for a YAK-18T that had crashed in the vicinity

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a few weeks before the start of the exercise and was still wearing the tactical codes of its former unit. It was the very first time 801 Escuadrón had participated in an international SAR exercise with the S-76. Unlike 2023's edition, the Armee de l'Air was unable to send any helicopter due to operational commitments.

Grifone 2024 gets underway

Except for the Guardia Costiera PH-139 'Nemo' that arrived a day later, all helicopters were at Capannori airport by the morning of September 16. The Marina Militare MH-101 made use of the paved runway before taxiing onto the airport's apron to minimise the negative effect of the strong rotor downwash. All other helicopters landed directly at their assigned parking spot on the apron except for the skids-equipped MH-169 and TH-500s which operated from the grass south of the runway. Late in the afternoon all participants went up for a familiarisation flight in the exercise area just north of the airport. Airspace over the Alpi Apuane and the Garfagnana region covering roughly 50 x 55km was reserved for the duration of the exercise.

Rotary assets of the Marina Militare, Guardia di Finanza, Carabinieri and Polizia returned to their home base that night and flew back to Lucca early the next day. Ahead of the

The light and nimble Breda-Nardi NH-500E, designated TH-500B in Italian military service, can take just two members of a CNSAS rescue team, due to its small cabin. However, when a rapid intervention is required, the speed of the TH-500 is highly beneficial to get to the emergency site quickly

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The first helicopter to be tasked to search for the missing French Yak-18T was this MH-169A 'Volpe 509' of the Sezione Aerea di Pisa. The Guardia di Finanza is the launch customer of the military version of the AW169 with 22 on order

An Italian Army UH-90A pilot from 27° Gruppo Squadroni 'Mercurio' is briefing the specifics of the helicopter to specialists from both the CNSAS and Soccorso Alpino of the Guardia di Finanza ahead of the shortlived LIVEX phase of exercise Grifone 2024

SOCCORSO ALPINO SPELEOLOGICO
SOCCORSO ALPINO SPELEOLOGICO

actual exercise on September 17, helicopter crews gave instruction to the various groups of SAR specialists. Each type of helicopter and specific operator has different cabin layouts, operational and safety procedures which needed to be demonstrated first. This included disembarkation, rescue hoist operation, emergency and escape procedures, location of emergency equipment in the cabin and the stowage of equipment taken onboard by the rescue teams such as backpacks and foldable stretchers. Observers from different neighbouring countries were also present to exchange and learn from each other's method of operation, including Albania, Algeria, Bosnia and Herzegovina, and Tunisia.

Grifone 2024 kicked off in earnest in the early afternoon with different simulated scenarios requiring the RCC and CNSAS to respond appropriately by setting up and co-ordinating search and rescue operations. However, rapidly deteriorating meteorological conditions in the mountains, including gale force winds and a dropping cloud base, affected the safe deployment of helicopters to such an extent that several missions had to be cancelled, with rescue crews having to be picked up at alternative extraction points by 4x4 vehicles.

Reality takes over

Earlier that day, on the morning of September 17, radar contact was lost with a French registered Yakovlev Yak-18T (F-HRYL). The aircraft had taken off from Paolucci Airport near Modena, en route to France when it went missing over the Northern Apennines in the province of Massa Carrara, in the proximity of the Grifone exercise area. The RCC immediately dispatched a HH-139B from Cervia which arrived in the search area within 45 minutes. The second helicopter to respond to the emergency was the Guardia di Finanza MH-169A present at Lucca, which was subsequently withdrawn from the exercise. The HH-139 searched in the mountains while the MH-169 flew patterns along the coastline, both without any result. In the evening, control of the search operation was transferred from the RCC at Poggio Renatico directly to the SAR Command at Lucca involved in Grifone. Exercise director Colonel Zanetti was now responsible for the co-ordination of all air assets in the Massa prefecture which included the majority of Grifone participants. As Zanetti explained: "The decision to call off the exercise was evident as we were now dealing with a full-scale SAR operation."

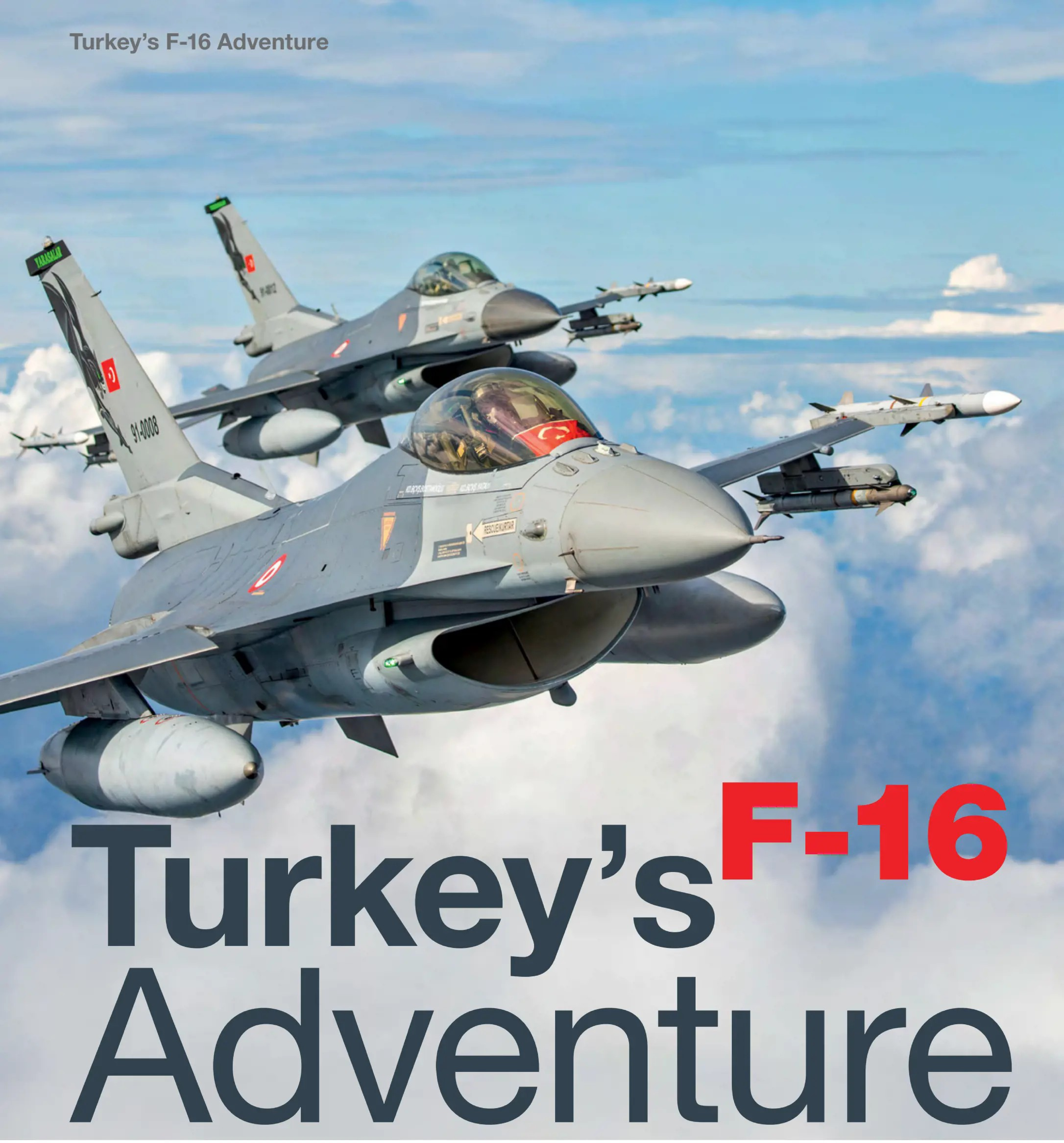
The team was tasked with co-ordinating the rescue effort, with several missions executed the next day hampered by strong winds and rain, with limited visibility due to mist and the rough mountainous terrain complicating the search. It was not until Thursday afternoon that a Tuscani CNSAS rescue team discovered the burnt wreckage on the slopes of Monte Bocco, a short distance from where the Yakovlev had departed. The plane's location had been determined by signals from the passengers' mobile phones. Unfortunately, all three French occupants had perished in the crash which was probably caused by severe weather conditions in the area at the time.

From exercise to real SAR

One of the key objectives of the Grifone exercise is to boost synergies between the Aeronautica Militare and other branches of the armed forces, government services and civil agencies in search and rescue operations, while constantly enhancing applied methods and procedures. As Zanetti stated: "The sudden emergency situation which arose during Grifone 2024 was testimony to the high proficiency level of the SAR community in Italy and partner nation Spain that can only be achieved and maintained through exercises like Grifone."

The seamless transition from exercising simulated scenarios to re-tasking many of the assets to perform the real-life rescue was extraordinary, and while the exercise consequently had to be cut short, the course of events will certainly be evaluated and conclusions drawn will be included in this year's edition of Grifone. **afm**

Turkey's F-16 Adventure



Above: ***F-16C Block 40Ms of 161 Filo 'Yarasalar' ('Bats') from Bandirma, seen on a NATO air policing mission over Poland in 2021. They are loaded with two AIM-120 AMRAAMs and two AIM-9 Sidewinders each – a standard CAP or QRA mission load. It is common to carry different AIM-120 variants in the same aircraft in the TurAF. The closest, 91-0008, has an AIM-120B under the right wing (not seen here) and an AIM-120C under the left wing is also a MiG killer, having shot down a Syrian MiG-23, with an AIM-120B AMRAAM in 2014*** *All photos, author*

Turkey has one of the biggest Lockheed Martin F-16 fleets in the world. **Cem Dogut** looks at how these jets have protected the vast country

IT ALL started on December 9, 1983, when a letter of acceptance (LOA) was signed with the Ronald Reagan-led US government: Turkey's F-16 adventure. The deal for 160 F-16s, comprising 136 F-16Cs, 24 F-16Ds and known as the Peace Onyx, was worth a staggering US$4bn. Under the agreement, the first eight aircraft would be manufactured at the General Dynamics Fort Worth facility, with the remainder built at Turkish Aircraft Industries Corporation (Türk Havacılık ve Uzay Sanayi Anonim Şirketi – TUSAŞ. General Electric's F110-GE-100 engine was selected in August 1984 to power these new, cutting-edge F-16C/Ds.

Turkish Aerospace Industries (TAI) started F-16 production on February 2, 1987, on the front, middle and rear fuselage assemblies. Production of the rear and middle fuselage began in 1988 and the wing in 1989. The first

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F-16 aircraft were delivered to the Turkish Air Force in a ceremony held at General Dynamics Fort Worth on July 17, 1987 and the first F-16C Block 30 (86-0068) manufactured at TAI carried out its maiden flight on October 14 that year. Six days later the first four F-16Ds were delivered to Turkey from the USA, amid great fanfare. By January 1990, 32 F-16C Block 30s and three F-16D Block 30s had been manufactured and the Block 40s, starting at the 44th aircraft, began delivery. Initially, the production process only involved assembly of parts, but TAI later manufactured 70% of the aircraft fuselage.

The Peace Onyx-II (PO-II) programme started on March 26, 1992, covering the acquisition of 80 F-16C/D Block 50s: 60 F-16C and 20 F-16Ds. Production started in July 1996 and with this project, Turkish Aerospace increased its aircraft manufacturing rate to 80% with the addition of the front fuselage parts and flaperons. The last airplane of the PO-II programme was delivered on November 12, 1999.

Peace Onyx-III (PO-III) was effectively the CCIP (Common Configuration Implementation Program) and was contracted on January 19, 2010. Under this, a total of 165 F-16C/D Block 40 and Block 50 aircraft were modernised. TAI delivered the first aircraft to the Turkish Air Force on November 2, 2011. The PO-III programme was successfully completed on April 10, 2015, with the delivery of the F-16D Block 40M (aircraft that received CCIP modernisation are identified with M) with tail number 89-0044.

While the CCIP project was continuing, 30 F-16C/D Block 50+ were ordered under Peace Onyx-IV (PO-IV) to replace the jets that had been lost. In December 2006, a decision was made to purchase 30 F-16 Block 50+ (16 Ds and 14 Cs) from Lockheed Martin through foreign military sales (FMS).

The programme ended with the last F-16D Block 50+ (07-1030) delivered on December 11, 2012. Unlike the PO-III, the PO-IV aircraft are equipped with the AN/ALQ-211(V)4 Advanced Integrated Defensive Electronic Warfare Suite (AIDEWS) and carry conformal fuel tanks, while the F-16D Block 50+ aircraft feature a dorsal spine. In this way, the AN/ALQ-211(V)4 can be carried internally, allowing the aircraft to be used for combat missions.

Above: ***After Turkey changed its rules of engagement against Syria in 2012, CAP F-16s carried live ammunition in areas close to Syrian airspace. F-16C Block 50Ms of the 141 'Kurt' Filo were among them. This squadron was the most prestigious F-16 unit before being shut down after the attempted coup in 2016. Since it was based in Ankara, all high-ranking generals in the headquarters flew with 141. When the squadron started flying F-104s in the 1960s, the sound of the Starfighter was likened to the howl of a wolf, and the squadron's callsign became Wolf (Kurt)***

Right: ***The 401st Test Squadron uses the orange CDART (Camera Data Acquisition Recording Telemetry) pod you see on the right wing tip for external load separation tests. It has AIM-120 geometry and inertial characteristics. The pod has two high-speed cameras that enable measurements to be made about the image with the help of reference points on the aircraft and the external load to be dropped. Data collected from the pod and the aircraft are recorded, allowing simultaneous transmission to the ground station. You can also see the TEBER ammunition under the wing; TEBER is an INS/GPS guidance kit***

Turkish Air Force F-16C/Ds Bases/Squadrons

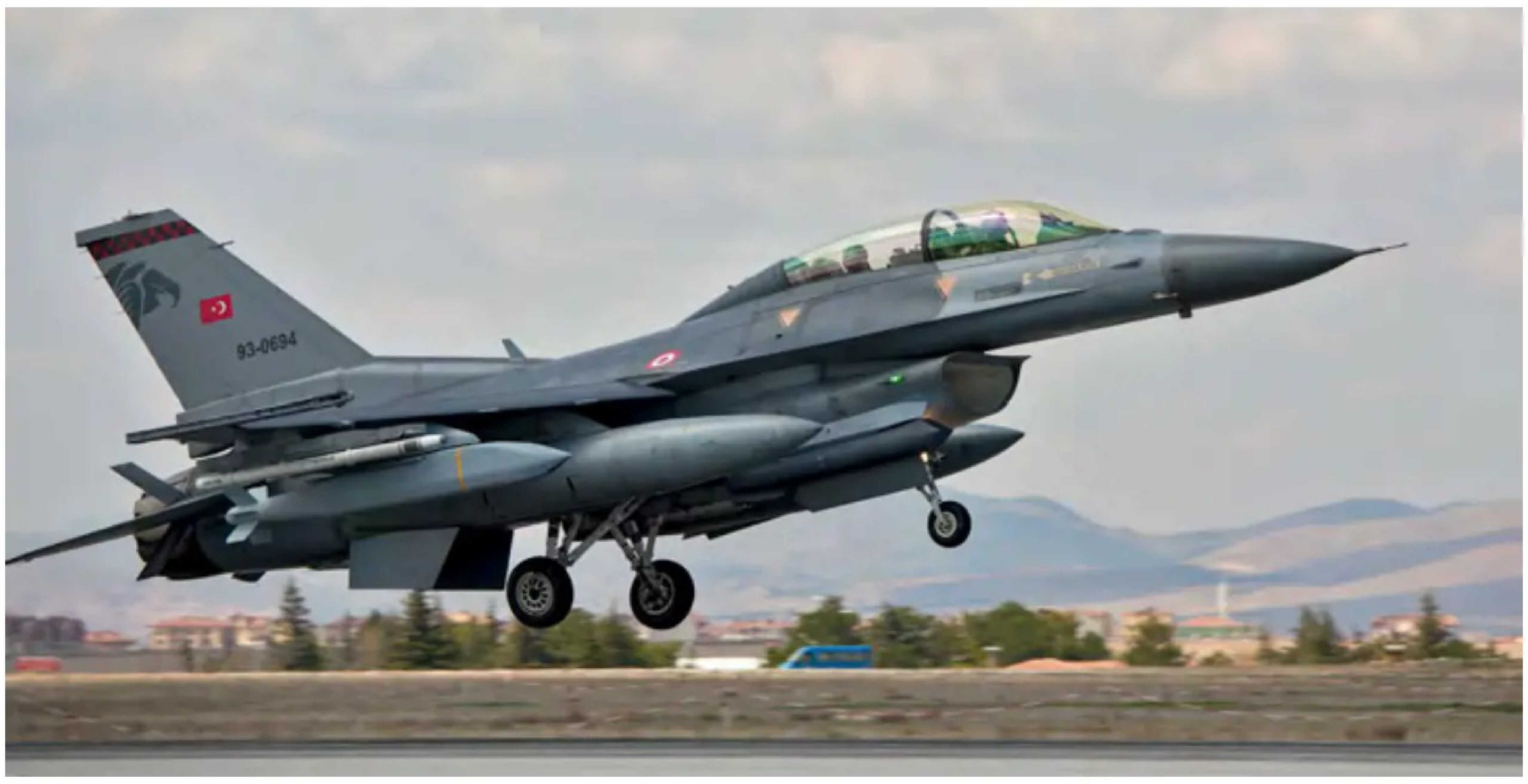
4. Ana Jet Üs Komutanlığı (4th Main Jet Base Command)

The 4th AJÜ/4th MJB in Ankara became the first F-16 base of the Turkish Air Force – TurAF), adjacent to TAI and using the same runway. The base is 22 miles (35kms) northwest of Ankara. The July 15, 2016, coup attempt was planned and co-ordinated at this base, so Akıncı base was downgraded to reserve airfield status by the TurAF in September 2016 and its name was subsequently returned to Mürted (meaning coward, which was the reason it was initially renamed). The base squadrons were transferred to different bases and today the facility hosts the Russian S-400 air defence system.

- **143 'Öncel' Filo**

The first F-16 squadron to be established was 143 'Öncel' Filo (143rd 'Öncel' Squadron) on July 15, 1987 and received its first F-16 in a state ceremony on October 20, 1987.

The main mission of the squadron is to train F-16 pilots. Officers who become F-16 pilots after flying training at the 2nd Main Jet Base in Çiğli, İzmir, are assigned initially to 143 Filo, where they receive ground lessons and then flight training with simulators, before flying F-16Ds with an instructor. As they progress in training, they become combat-ready F-16C pilots.



Above: ***Along with the CCIP modernisation, new missiles were ordered. One of them was the AGM-154 joint stand-off weapon seen on this 182 'Atmaca' ('Hawk') Filo F-16D; precision-guided, long-range glide bomb developed by Raytheon. This is the AGM-154C version, equipped with a BROACH multi-stage penetrating warhead, designed for hardened and fortified targets like bunkers and command centres. It carries an infrared seeker used in the terminal phase, together with INS/GPS guidance***

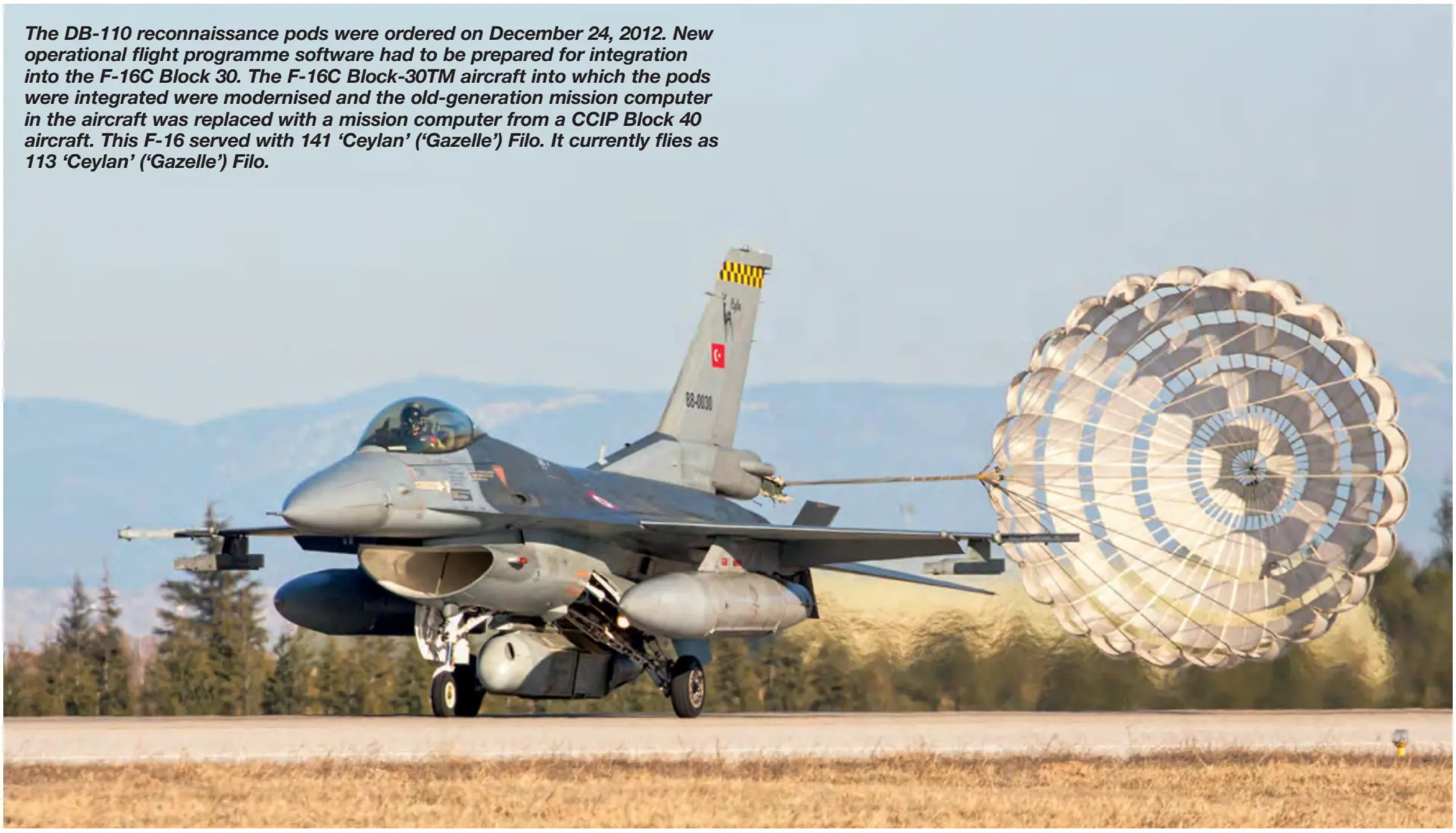
After the coup attempt, 143 Filo was initially sent to the 5th AJÜ (Main Jet Base) in Merzifon re-numbered 153 Filo and then later to the 9th AJÜ in Balıkesir as the 193 Filo, where it is today.

- **142 'Ceylan' ('Gazelle') Filo**

The 142 'Ceylan' Filo, established on April 11, 1952, received its first F-16s on July 3, 1989. A total of 20 F-16 aircraft – three F-16Ds and 17 F-16Cs – entered the squadron's inventory, 142 Filo becoming the first combat F-16 squadron of the TurAF. After the coup attempt, the 142 Filo was sent to the 1st Main Jet Base in Eskişehir and became 113 Filo.

- **141 'Kurt' ('Wolf') Filo**

The 141 'Kurt' Filo, established on March 25, 1963, received its first F-16s on February 26, 1990. The squadron participated in the TLP course held in Belgium in 2000 and 2001. With the experience gained here, the 141 Filo ran the F-16 Weapon Tactics Course for the first time in the history of the TurAF, on February 12, 2001. The first Anatolian Eagle training exercise, held in Konya June 18-29, 2001, was planned and conducted by the 141 Filo. After the attempted coup, the 141 Filo was sent to the 5th Main Jet Base in Merzifon under the name of the 151 Filo. After a while, 'Wolf' Squadron was disbanded.



The DB-110 reconnaissance pods were ordered on December 24, 2012. New operational flight programme software had to be prepared for integration into the F-16C Block 30. The F-16C Block-30TM aircraft into which the pods were integrated were modernised and the old-generation mission computer in the aircraft was replaced with a mission computer from a CCIP Block 40 aircraft. This F-16 served with 141 'Ceylan' ('Gazelle') Filo. It currently flies as 113 'Ceylan' ('Gazelle') Filo.

6. Ana Jet Üs Komutanlığı (6th Main Jet Base Command)

The 6th AJÜ/6th MJB is located in Bandırma, a district on the Marmaras coast, 50 miles (80kms) from Balıkesir city centre. The 6th MJB began modernising with F-16C/Ds in 1991. Together with the 9th Main Jet Base in Balıkesir, it is responsible for the security of Western Anatolia.

• 162 'Zıpkın' ('Harpoon') Filo

The transfer of the 6th Hunting Regiment to the newly completed Bandırma Airfield on November 24, 1949 is considered to be the establishment of the squadron. The 162 Filo received its F-16 aircraft at a state ceremony on May 1, 1991. The squadron, which operated in the air defence role until July 1, 1999, served as a LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) squadron for a short time. On July 3, 2000, the LANTIRN systems of 16 F-16Cs and two F-16Ds in the squadron inventory were transferred to the 181 Filo. After this date, 162 Filo started to perform air defence missions again.

• 161 'Kartal' ('Eagle') Filo

The 161 Filo was established in 1952. Forty years later, on June 19, 1992, the 161 Filo was equipped with F-16 Fighting Falcon aircraft.

The establishment of the LANTIRN system, which provided the air force with a night operation capability, first started with 161 Filo in 1993. On July 1, 1994, training was completed and the unit became the first LANTIRN-capable Turkish squadron. The TurAF was the first operator of the LANTIRN system outside the United States.

*Above: **The 151 'Tunç' ('Bronze') Filo has the motto 'Keepers of the East'. The squadron is responsible for the air defence of Turkey's troubled border with Syria and Iraq and achieved the first air-to-air kill after the increased tension with Syria in 2012. One of its F-16s shot down a Mi-17 and MiG-23 of the Syrian Arab Air Force. The words Savaşçıların Üssü mean 'Base of the Warriors' and they are written across the top of its tail***

*Below: **The F-16C Block 50+ with the bat emblem on its tail belongs to 161 'Kartal' ('Eagle') Filo, one of the two TurAF LANTIRN squadrons. The 161st is the only squadron with two different tail emblems: the bat symbolises dominance at night; the eagle emblem on the other side of the tail symbolises dominance in the day. Makes sense!***

When SoloTürk was first established, it served 141 Filo. This F-16D Block 40, 91-0022, is the jet the SoloTürk pilot trained in. In this shot, it is landing on the Konya runway for Anatolian Eagle training

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The 181 'Pars' ('Leopard') Filo flies both Block 50+ and Block 40Ms and is the other LANTIRN squadron. It is the most active unit in counter-terrorism operations at home and abroad. This photo was taken at the 7th Main Jet Base in Malatya. Depending on requirements, aircraft from different bases come here to participate in operations

9. Ana Jet Üs Komutanlığı (9th Main Jet Base Command)

The 9th AJÜ/9th MJB is located in the Altıeylül district of Balıkesir and was established in 1951 as Turkey's first jet base. The 9th AJÜ began conversion to F-16C/Ds in 1993.

- **192 'Kaplan' ('Tiger') Filo**

The 192 Filo was equipped with F-84G Thunderjets in 1952, within the 9th AJÜ. On June 8, 1993, the 192 Filo was modernised with F-16s and since 1990 has been a member of the Tiger Association, thus traditionally participating in the Tiger Meet once a year.

- **191 'Kobra' ('Cobra') Filo**

The unit stood up as 191 Filo in 1951, operating P-47D Thunderbolts. On September 23, 1994, the 191 Filo was modernised with F-16 Block 40s that were replaced by Block 50s on June 23, 1998.

- **193 'Öncel' Filo**

After the coup attempt, the 143 Filo was first sent to the 5th AJÜ in Merzifon as 153 Filo and then to the 9th AJÜ in Balıkesir as 193 Filo, where it currently operates.

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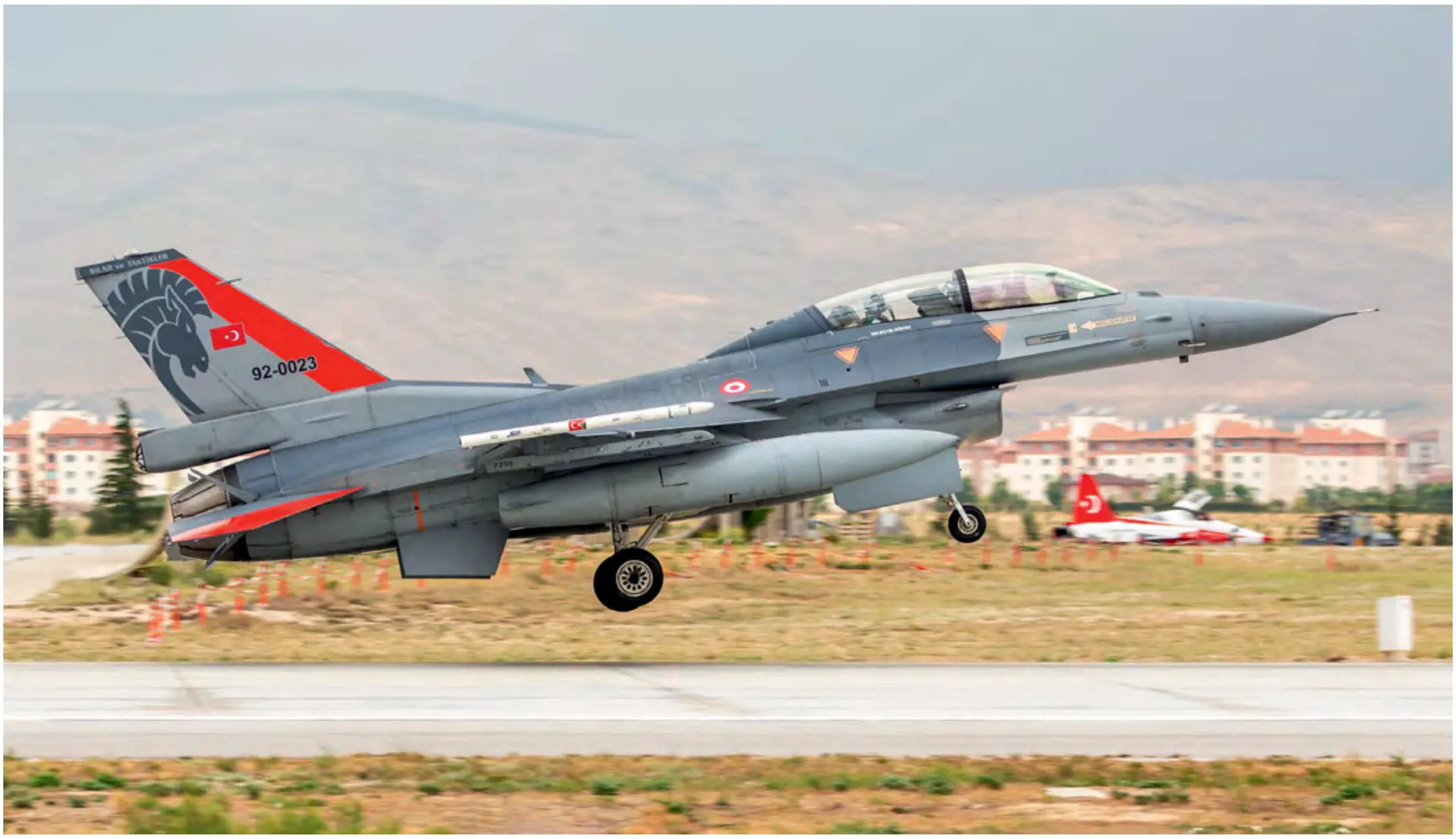
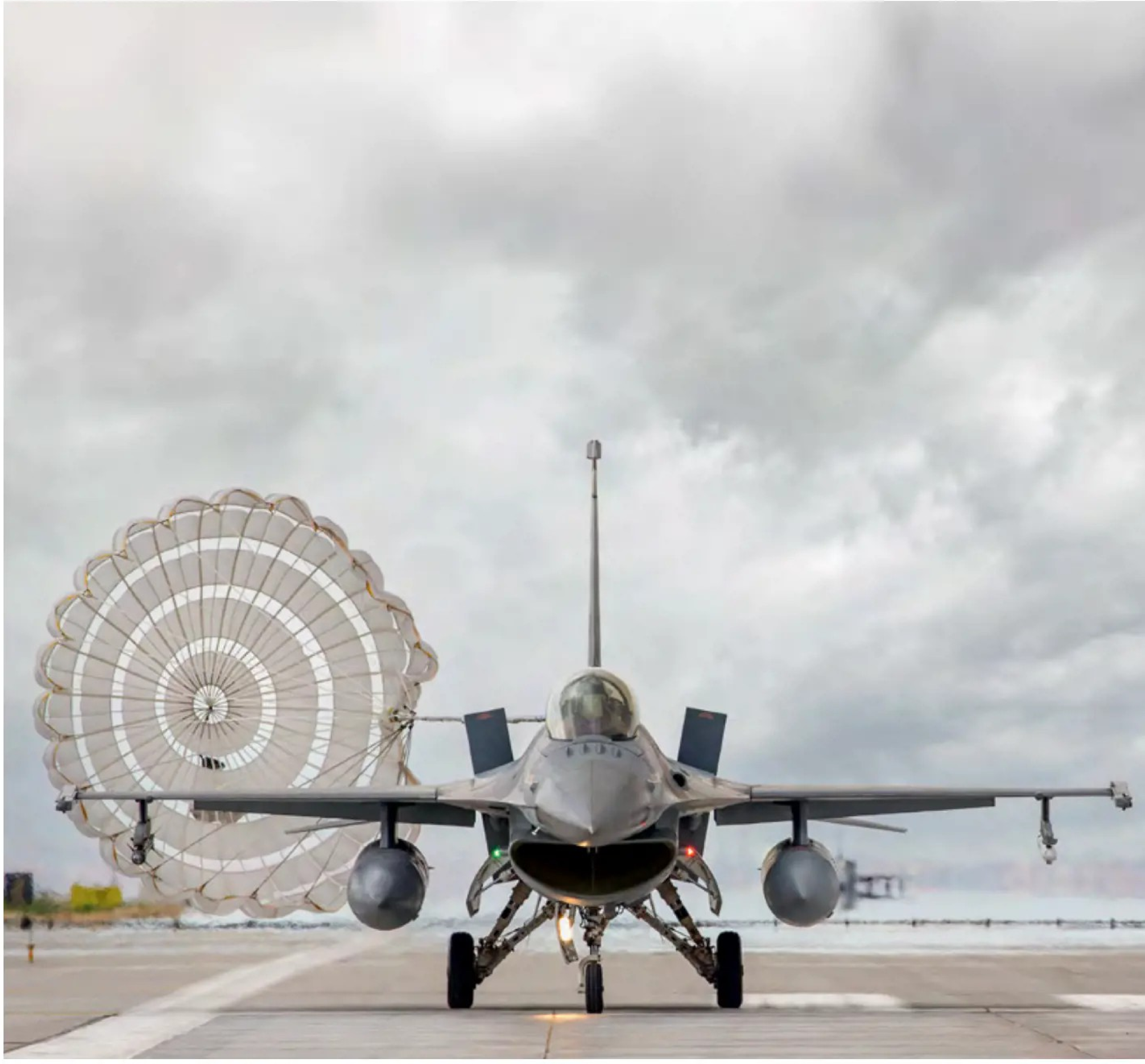
Above: ***Delivered at a ceremony held at the General Dynamics Fort Worth facility on July 17, 1987, the F-16C Block 30, 86-0066, became the first single-seat F-16 delivered to the Turkish Air Force. With the F-16 Block 30 Structural Modernisation Program contract signed on August 10, 2015, the 8,000-hour fuselage life of the 35 F-16C/D Block 30s in the inventory is being extended by 4,000 hours to 12,000 hours. This photo was taken during modernisation***

below: ***The Anatolian Eagle Training Centre has become one of the world's leading centres of training excellence. All F-16 squadrons participate in the Anatolian Eagle exercise, which is one of the largest and most important exercises in Europe in terms of scope, number of participants and technologies used. This pilot from the 162 'Zıpkın' Filo departs Konya during Anatolian Eagle 2023***



Above: ***The 132 Weapons and Tactics Filo flies as Red Air during Anatolian Eagle training, which is why it calls itself 'Red Daggers'. In 2021, the vertical tails and horizontal stabilisers of its aircraft were painted red to depict the role***

below: ***The TurAF F-16s all use parachutes, except for the Block 50s. This F-16C Block 40M rolls towards the end of the runway with both parachute and air brakes extended*** *below:* ***The 132 Weapons and Tactics Filo flies as Red Air during Anatolian Eagle training, which is why it calls itself 'Red Daggers'. In 2021, the vertical tails and horizontal stabilisers of its aircraft were painted red to depict the role***



8. Ana Jet Üs Komutanlığı (8th Main Jet Base Command)

The 8th AJÜ/8th MJB is located in Diyarbakır province in southeastern Turkey. It is the closest base to the areas where anti-terror operations are carried out in the region, both domestically and abroad. It is the most active combat flight base in Turkey.

- **181 'Pars' ('Leopard') Filo**

The squadron, which was established in Erzincan in 1947, started to serve in Diyarbakır on June 23, 1952. On November 5, 1994, the 181 Filo retired its CF-104G Starfighters with F-16s. On July 3, 2000, the squadron's F-16s were equipped with the LANTIRN capability, and F-16C/D Block 40s equipped with AN/AAQ-13 navigation and AN/AAQ-14 targeting pods began operating.

- **182 'Atmaca' ('Hawk') Filo**

Established in Erzincan in 1947, the squadron began operating from Diyarbakır on June 23, 1952 as the 183 Filo. On April 4, 1972, that was changed to 182 Filo and on October 26, 1996, the 182 Filo saw the TurAF's last Starfighters replaced by F-16s. The main task of the squadron is the air defence of eastern Turkey.

5. Ana Jet Üs Komutanlığı (5th Main Jet Base Command)

The 5th AJÜ/5th MJB is located in the Merzifon district of Amasya and is responsible for air defence of the Black Sea Region. It was established in 1956, with the transfer of F-86E Sabres to Merzifon.

- **151 'Tunç' ('Bronze') Filo**

The squadron was formed on September 11, 1956 at Merzifon. On June 11, 1999, the 151 Filo was modernised with F-16s with its primary mission defined as SEAD (Suppression of Enemy Air Defence). The first AGM-88 HARM firing in Turkey was carried out on April 18, 2006 against Nike radars located in the Karapınar/Konya firing range, and the targets were successfully destroyed in both firings.

- **152 'Akıncı' ('Raiders') Filo**

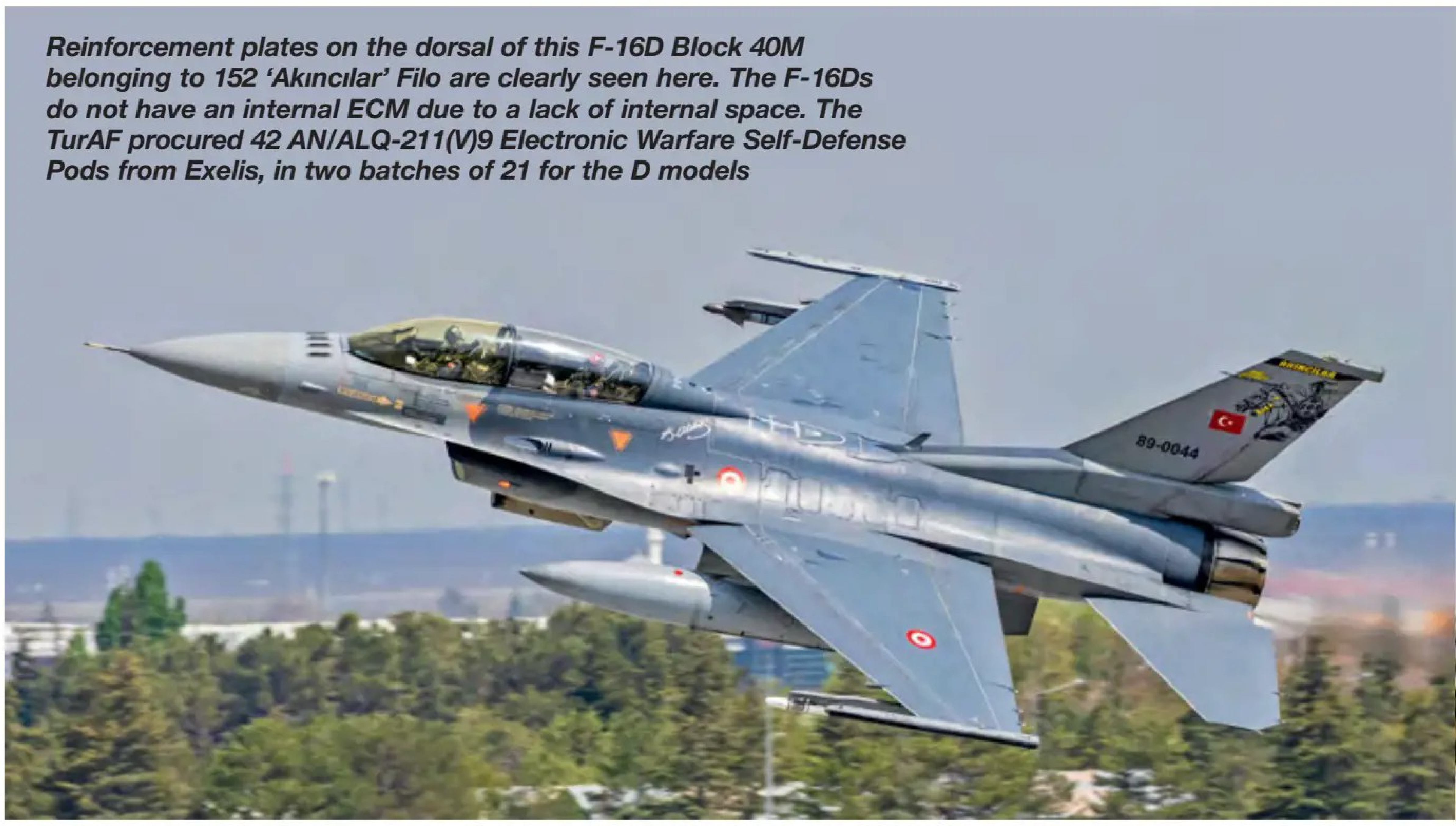
On March 10, 1997, ten F-16 Block-50s serving the 4th AJÜ became part of 152 Filo and were transferred to the Merzifon 5th AJÜ Command in April 1997; 152 Filo then moved from Merzifon to Incirlik after the July 2016 coup attempt, initially temporarily, but now serving permanently at the large base. As a result its 10 Tanker Üs Komutanlığı" (10th Tanker Base Command) title changed to 10 Ana Jet Üs Komutanlığı (10th Main Jet Base Command) in April 2024, to better reflect its role. The 152 Filo became the squadron of this newly established base.

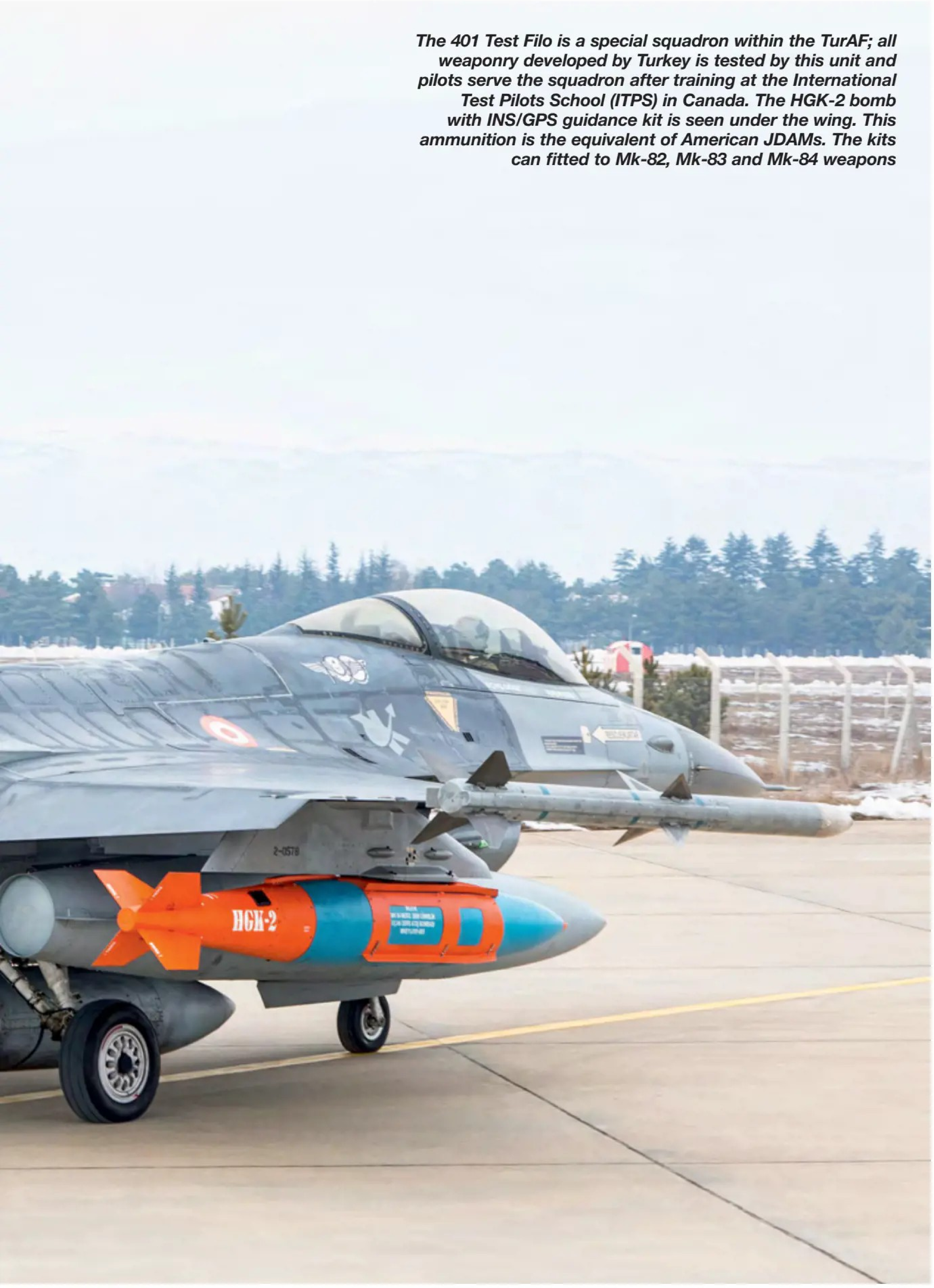
3. Ana Jet Üs Komutanlığı (3rd Main Jet Base Command)

The 3rd AJÜ/3rd MJB is located in Konya and is one of the most active bases in Turkey. Numerous exercises, especially the Anatolian Eagle, are held at this base every year.

- **132 'Hançer' ('Dagger') Filo**

The main mission of the 132 Silah ve Taktikler Filo (Weapon and Tactics Squadron) is to train instructor pilots to increase the combat mission effectiveness of the operational air force units. For this purpose, it added two different types of combat aircraft (ten F-16C/Ds and ten F-4E-2020s) to its inventory on August 28, 2006. The 132 Filo flies the Red role (Aggressor) in Anatolian Eagle exercises.


Reinforcement plates on the dorsal of this F-16D Block 40M belonging to 152 'Akıncılar' Filo are clearly seen here. The F-16Ds do not have an internal ECM due to a lack of internal space. The TurAF procured 42 AN/ALQ-211(V)9 Electronic Warfare Self-Defense Pods from Exelis, in two batches of 21 for the D models



The 401 Test Filo is a special squadron within the TurAF; all weaponry developed by Turkey is tested by this unit and pilots serve the squadron after training at the International Test Pilots School (ITPS) in Canada. The HGK-2 bomb with INS/GPS guidance kit is seen under the wing. This ammunition is the equivalent of American JDAMs. The kits can fitted to Mk-82, Mk-83 and Mk-84 weapons

F-16C/D Block 50+ jets, unlike other F-16s in the TurAF, are fitted with conformal fuel tanks. They carry 450 gallons (2,271 litres) of fuel, increasing the range by 20% to 40% according to the mission profile without affecting its G limit. They also use AN/ALQ-211(V)4 ECMs and, thanks to the dorsal spine, have more space for internal electronic countermeasures. They are used as deep strike aircraft

1. Ana Jet Üs Komutanlığı (1st Main Jet Base Command)

The 1st AJÜ/1st MJB is based in Eskişehir, which hosts the Combat Air Force and Air Missile Defence Command.

- **401 Test Filo**

The 401 Geliştirme ve Test Kıta (Development Test Detachment) was established on April 17, 2013 and became the 401 Test Filo on March 13, 2015.

The squadron's capabilities mean Turkey is one of just a few countries that has the opportunity to carry out flight testing activities nationally. Since its establishment, it has successfully carried out test activities of both the ammunition and systems developed by the Turkish Defence Industry and newly acquired ammunition and systems of the Turkish Air Force.

- **113 'Ceylan' ('Gazelle') Filo**

After the coup attempt, the 142 Filo was sent to the 1st AJÜ in Eskişehir as the 113 Filo. The squadron was flying the RF-4E/TM before it was disbanded.

16. Ana Jet Üs Komutanlığı (16th Main Jet Base Command)

The 16th AJÜ/16th MJB is located in Dalaman, Mugla. The Dalaman Airfield Command was established in 1985 and has been used for reserve airfield and QRA duties since then. Unmanned aerial vehicles (UAVs) belonging to the Turkish Air Force were operating in Dalaman, which is a convenient location for access to the Aegean and Mediterranean Seas in the west of Turkey. It is also very close to Aksaz Naval Base, the largest such facility in Turkey and an important one for naval aviation; the S-70 SeaHawk helicopter, P-72 and P-235 maritime patrol aircraft all operate from this base. In addition, a naval fleet of TB2, Anka and Aksungur UAVs is located there.

At the end of 2024, Dalaman Airfield Command was upgraded to the Main Jet Base Command level, taking into account operational needs, with the Anka, Akinci and F-16s deployed there.

- **166 'Uçbey' Filo**

With the establishment of the main jet base, the 166 Filo was established as the last squadron to use F-16s, with the first jet joining the squadron last November.

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The AN/AAQ-33 Sniper targeting pod is used against ground targets as well as air targets. Thanks to the Sniper, the identity of the target detected from long distances (approximately 20 miles) can be determined. It offers a simple alternative to the IRST (infra-red search and track) system that the F-16 does not have

An F-16C is in the shelter, standing guard with four LGK-82s – Mk 82s equipped with laser guidance kits and one AIM-9 and AIM-120 each. Aircraft equipped with different munitions are always kept ready for emergency operations. Thus, it is possible to quickly reach a target detected by a UAV or a ground element in need of urgent fire support

Turkish Air Force operations

Due to its geopolitical position, Turkey is either adjacent to or very near some troubled areas. The Turkish Air Force actively participated in the Peace Support Operations organised in various regions, especially in the Middle East and the Balkans. At the same time, it carried out operations against terrorist organisations at home and in neighbouring countries.

Bosnia – Herzegovina and Kosovo operations

Turkey joined the 'Deny Flight' operation, with 18 F-16s based at Ghedi Air Base, Italy, on April 19, 1993. The aim was to stop any Yugoslav attack in the closed airspace of Bosnia and Herzegovina and Kosovo. Several different F-16 squadrons were involved, until the last flight by 182 Filo on August 7, 2001. During that eight-year mission period, TurAF F-16s completed approximately 34,000 flight hours.

NATO launched Operation Deliberate Force on August 30, 1995, which ended on September 20 that year. The TurAF flew 74 sorties throughout the operation for CAP (Combat Air Patrol) and CAS/BAI (Close Air Support/Battlefield Air Interdiction) missions.

On March 24, 1999, NATO launched Operation Allied Force against Yugoslavia, which saw the TurAF fly a total of 2,297 hours during 444 day and night sorties.

Operations in northern Iraq

The PKK (Partiya Karkerên Kurdistanê / Kurdistan Workers Party), which was established in 1978, has a Marxist-Leninist and ethnic separatist-based ideology. Considered a terrorist organisation by the USA and EU, the PKK has tried to expand its militant staff with 'propaganda' attacks started in the southeastern Anatolia region since 1983. The first such terrorist attack took place in Turkey during 1984.

A security protocol was signed between Iraq and Turkey on October 15, 1984. With this protocol, Turkey gained the right to conduct land and air operations in northern Iraq.

The first major operation in which F-16s participated was the Çelik Harekatı (Operation Steel), that began in northern Iraq in March 1995. During the operation, F-16s dropped 1,688 Mk 82 bombs in 319 sorties.

Çekiç Harekatı (Operation Hammer) started on April 30 and ended on July 7, 1997. In the TurAF air operation, 468 sorties were flown by F-16 and F-4 aircraft.

Operations of all sizes continue routinely in northern Iraq. Aircraft from bases in the west support the 181 Filo participating in these operations, with the support of KC-135Rs. All the TurAF fighter squadrons participate in the missions and gain invaluable experience in this real combat environment.

Northern Syria

After the RF-4E/TM Phantom II 77-0314 reconnaissance aircraft was shot down by Syria on June 22, 2012, Turkey altered its rules of engagement. Pursuant to the 'zero tolerance' policy implemented by Turkey within the framework of the new rules of engagement, a Syrian Air Force Mi-17 helicopter was shot down on September 16, 2013.

The F-16C involved was a Block 40M (92-005, belonging to the 182 Filo) that was on CAP in the region. At 1427hrs, it fired an AIM-9X at the Mi-17 flying in Turkish airspace, which fell approximately one kilometre inside the Syrian side of the border. This shoot-down was the AIM-9X's first real combat hit.

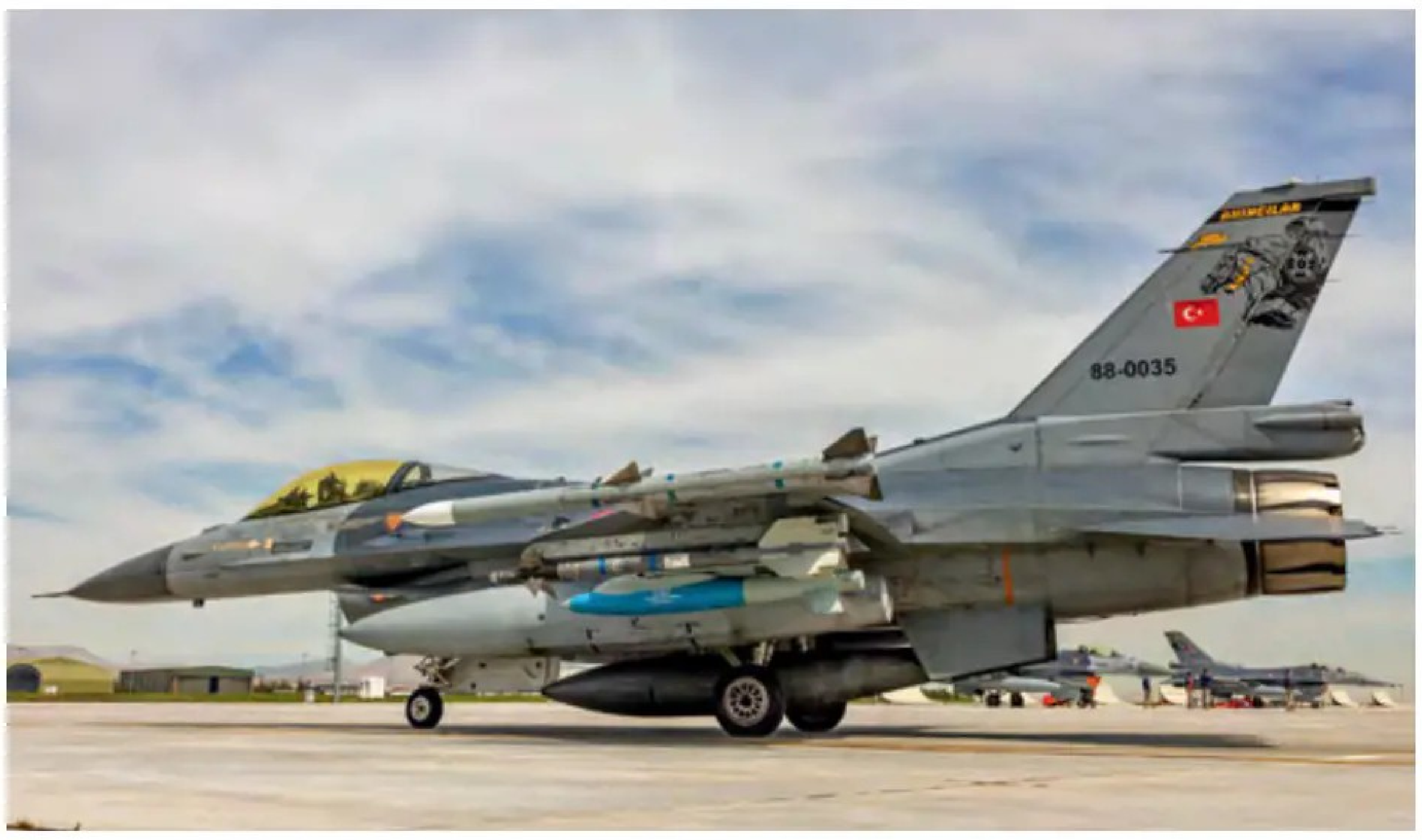
On March 23, 2014, two MiG-23s belonging to Syria were warned four times that they were approaching Turkish airspace. One Mig-23 continued to fly into Turkish airspace for one mile. An F-16C Block 40M (91-0008) aircraft, on CAP in the region, fired AIM-120B missiles at the intruding jet at 1314hrs, in accordance with the rules of engagement, and the Syrian airplane was hit.

On November 24, 2015, two Su-24M aircraft of the Russian Air Force violated Turkish airspace. After the breach, one of the Russian aircraft returned to Syrian airspace. However, F-16C Block 40M (90-0006 with AIM-120C-5), on CAP in accordance with the rules of engagement, opened fire on the other aircraft still over Turkish territory. The Su-24M (RF-90932) subsequently crashed in Syria.

More than 1600 sorties were carried out during the Fırat Kalkanı Harekatı (Euphrates Shield Operation) from August 24, 2016 to March 29, 2017. Combat flights were carried out by F-16 and F-4 aircrafts and led to more than 2,300 targets destroyed.

Zeytin Dalı Harekatı (Operation Olive Branch), which is complementary to Operation

On November 30, 2024, four Turkish F-16 fighter jets flew to the 86th Borcea Air Base in Romania to participate in NATO's enhanced air policing mission in the south for the first time. The Turkish detachment augments Romanian Air Force jets and surface-based air defences. This operation in Romania was the third TurAF F-16 NATO air policing mission, following Lithuania in 2006 and Poland in 2021



This F-16C, 88-0035, carries the KGK-82 – is a wing-assisted guidance kit that converts the current unguided general purpose bombs like the 1,000lb Mk 83 and 500lb Mk 82 into long-range, air-to-ground smart ammunition. The KGK uses the same guidance system as the HGK. With the former, jets can accurately strike targets around 100kms away in all weather conditions

Euphrates Shield, was carried out by the Turkish Armed Forces to neutralise PKK/YPG and Islamic State terrorists in northwest Syria to ensure security and stability on our borders and in the region. Operation Olive Branch started with the raid that saw 72 aircraft participate simultaneously to mark the 72 Turkish Armed Forces personnel who died in Operation Euphrates Shield on January 20, 2018. During the operation, the Turkish Air Force made around 800 sorties.

Bahar Kalkanı Harekatı (Operation Spring Shield) was launched on February 27, 2020. During the operation, air defence systems, ten ammunition depots and a headquarters building were destroyed. Since warplanes did not enter Syrian airspace in this operation, UAVs and UCAVs (Turkish-made armed drones) were used extensively. During the operation, the Kuweires Air Base (About 37 miles, or 60kms, from the Turkish border) used by Syrian Air Force L-39 aircraft was also hit, either by Turkish SOMs (stand-off munitions) or JSOWs (joint stand-off weapons).

On March 1, 2020, two Su-24 aircraft belonging to the Syrian Arab Air Force were shot down. F-16C Block 50M (93-0675) of the 152 Filo was on CAP in Turkish airspace and, via Link-16, was transmitted an aerial picture of the Su-24s, detected by the E-7T early warning and command, flying in the operational area. The F-16 Block 50 that was authorised for the engagement shot down both Su-24s with two AIM-120 AMRAAMs (advanced medium range air-to-air missiles). On March 3, 2020, a Syrian Air Force L-39 close air support aircraft flying towards the Peace Shield Operation area was shot down by F-16C Block 50M (93-0677) of 152 Filo with an AIM-120 AMRAAM from a distance of approximately 28 miles (45kms). During the operation, eight helicopters and two UAVs belonging to Syria were shot down.

The F-16 began its adventure in Turkey 38 years ago. Turkey has the third largest F-16 fleet in the world and uses it intensively. It will continue to use F-16s for many years, both with the national Özgür modernisation and the Viper modernisation to be carried out with the USA.

Vipers on air patrol over the spectacular natural beauty of the Hel peninsula in Poland during 2021. Contrary to popular belief, Turkey and Russia are not allies; Turkey has a relationship of interest with its neighbour Russia. At times it is a partnership and at others it comes to the brink of war, as in the downing of the Russian Su-24 Fencer in November 2015

ÖZGÜR (Liberty) Project

The ÖZGÜR Project started on December 15, 2010 at the request of the Air Force Command, aimed at modernising 35 F-16 Block 30 aircraft not included in the CCIP project with a national mission computer and avionics. With the nationalisation of mission computers, the project aims to ensure the integration of national air-to-air and air-to-ground munitions. ASELSAN (Askeri Elektronik Sanayi – Military Electronics Industry) develops the hardware of the mission computer used in modernisation, and Turkish Aerospace develops the operational flight programme (OFP) software. An F-16C Block 30 (87-0019) was used as the prototype aircraft in the project. The cockpit of the airplane was also updated and a new full-colour multifunction display (MFD), middle cockpit display and engine display have been added. After the acceptance tests of the first modernised aircraft were successfully completed, the serial production phase began. Within the scope of the ÖZGÜR Modernisation Project, three modernised F-16 Block 30 fighter jets were delivered to the Turkish Air Force Command in 2023. When the MURAD F-16 nose radar project developed by Aselsan is completed, this radar will replace the AN/APG-68. The first flight of the X-Band MURAD AESA Nose/Fire Control Radar – under development with flight tests on a prototype aircraft by ASELSAN – was performed on the ÖZGÜR modernised F-16C Block 30 prototype aircraft on February 15, 2024. The MURAD X-Band AESA aircraft nose radar has the capabilities of automatic recognition, multiple target tracking, ground mapping, range measurement, automatic altitude determination, under-cloud surveillance with SAR, automatic target limitation with artificial intelligence-supported algorithms, wide-band radar spectrum monitoring (ESM) and directional electronic jamming (ECM) and provides more effective guidance to the ammunition.

Undoubtedly, with continued modernisation and new acquisitions, the Turkish Air Force F-16 still has plenty of life allowing it to protect Turkish skies for years to come. **afm**

Polish eagles fly high

Bartosz Głowacki marks the first year in service for Poland's fleet of KAI FA-50GF aircraft, known by their Korean manufacturer as the Golden Eagle

The first two FA-50GFs (designated by the manufacturer as Block 10) were delivered to Poland on July 9, 2023, inside a Korean Air Cargo Boeing 747-400. They were reassembled on July 9-21, and the first one flew on July 22, 2023, at the 23rd Tactical Air Base in Mińsk Mazowiecki. Subsequent aircraft were delivered in pairs on August 22, September 19, October 24, November 26, and December 29, 2023.

New challenges

Acceptance of the aircraft was a complicated process. The FA-50GFs had already been assembled in Korea, checked, and had undergone a technical flight. Then the aircraft with the completed wings, stabilisers, and engines were packed and flown to Poland. They were reassembled by technicians from KAI. After checking the compliance of the technical documentation and the aircraft, a test flight was performed. Then, Polish technicians and engineers verified the documentation, checked the aircraft from the outside, checked the radio-electronic systems, and performed an engine test. The last activity was a test flight, with Korean and Polish pilots onboard. After its successful completion, the engine was checked with an endoscope to see if it was damaged. After this check, the acceptance protocol was signed and then it was possible to begin

another complicated procedure of implementing the FA-50GF into the Polish Air Force.

"When we learned that the FA-50s were to be here instead of the MiG-29s, the mood was mixed. People who worked on the MiG-29 knew that a certain era was ending and that some of them might have to end their military careers because they would not be able to train for the new equipment, not because of fear of the new technology, but because of problems related to the English language," says Lt. Col. Arkadiusz Nawrot, head of Aviation Technology in the 23rd TAB.

However, there was a large group of young people who were not afraid of new challenges, who knew that this was the future for them. "When new aircraft enters service, it is known that it will be used for a very long time and people who start working can link their future with the base. Many made the effort, trained, we have examples of technicians who turned 50 and were able to pass the technical English exam and are currently operating the FA-50GF. More than 20 people had to change positions to those where English was not required." adds Lt. Col. Nawrot.

"I really wanted to transfer [to the 23rd TAB], I saw the potential here. The experience I gained in the previous TAB was helpful, because the FA-50GF has a lot in common with the F-16 in terms of design, and in terms of documentation, control and measurement equipment, or the maintenance system, they are practically the same, so if you took an F-16 technician, put him next to the FA-50 and gave him documentation, he would be able to operate this aircraft on the fly," emphasises Capt. Małgorzata Urban, commander of the aircraft operation section of the maintenance squadron.

Above: ***The Air Force has 12 FA-50GF light combat aircraft in its inventory, which were delivered to Poland from July to the end of December 2023***
All images: Bartosz Głowacki

Below: ***The Polish FA-50GFs are stationed in modernised shelters that previously housed MiG-29s, which helps maintain their high airworthiness***

Above: ***A fake crew cabin has been painted on the lower part of the FA50-GF fuselage. This solution is used by the air forces of several countries to disorient the enemy during dogfight***

Below: ***The first group of 8 Air Force pilots, who completed training in 2023 in the Republic of Korea, are improving their skills in the country, already on the FA-50GF with a white and red checkerboard***

Self-sufficient

As personnel from the 23rd TAB say, the entire FA-50 maintenance system is very well planned, compared to MiG-29. Everything is systematised and forms a logical whole, so it was easy for them to train in the operation of the new aircraft, even though they had no previous experience with the new documentation, nomenclature and the English language. Personnel from Minsk were trained to perform current maintenance (O-level) and periodic maintenance and repairs (I-level) in four specialties. Talks are also being held (at higher levels) so that the 23rd TAB would ultimately have the full range of I-level capabilities regarding the airframe and individual specialties, as well as I-level engine MRO, including, in addition to dismantling and replacing individual assemblies, also their inspection and, in some cases, repair of assemblies, which until now was impossible in the case of the MiG-29.

"Obtaining the I-Level level in all specialties will allow us to operate aircraft very widely and perform technical maintenance not only of the equipment of the 23rd TAB, but also of aircraft from the squadron of the 21st TAB from Świdwin, so we would be self-sufficient for many years," says Lt. Col. Marcin Boruta, deputy commander of the Technical Service Group.

"In general, the number of specialists needed to service the FA-50 is greater and more divided than in the case of the MiG-29. According to the new position, the technical service group consists of 550 engineers and technicians of 16 different specialties. However, in reality, one technician is able to prepare to mission an aircraft that is airworthy," adds Lt. Col. Boruta.

"Since the level of knowledge and preparation of our technical staff is so high, we see the possibility of training these people in several specialties (e.g. communication, navigation and identification systems, electronic warfare systems and fire control radar), which will improve functioning," emphasises Lt. Col. Nawrot.

By 25 October 2024, Polish FA-50GFs had completed 618 flights, lasting a total of more than 610 hours. The longest flight lasted 2hrs 12min. The most hours were flown on October 11, when six FA-50s spent a total of 11.5hrs in the air.

Intense pace

In mid-2022, when the option of training abroad on the FA-50 appeared, the criteria for selecting Polish Air Force pilots were outlined – they had to have appropriate experience, flight time and at least several years of service. Unlike the technical staff, there was no problem with English, health issues were more important.

On this basis, a group of promising pilots was taken from Minsk, Radom and Świdwin airbases, flying three types of aircraft (MiG-29, PZL-130 Orlik and Su-22). "First of all, in addition to experience, the desire to face this issue was necessary, because at that time there were many unknowns and we did not know what to expect," recalls one of the FA-50GF pilots, whose personal details are classified for security reasons.

The first solo flight took place only in Poland, November 16, 2023. The plans assume that after reaching full operational capability of the FA-50GF, the annual flight time of each pilot will be 150-250h, however,

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RESCUE
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since it is a two-seater aircraft, it will certainly be possible to build much greater flight time than in other units.

"I am not able to answer when the initial and full combat capability will be reported. It depends on many external factors. Certain issues are still being processed when it comes to obtaining the necessary resources to achieve such capabilities. When it comes to training of flight and ground personnel, we are at a very good level. Everything is happening at a good pace and according to plan," says the FA-50GF pilot.

As the pilots of the 23rd TAB say, the most important thing is to complete tasks on time. The priority at the moment is, both in terms of flight personnel and technical personnel, to reach the level of full training capability of subsequent groups of personnel, primarily flying. Ultimately 2 squadrons are to be stationed in the 23rd TAB – one equipped with FA-50GF and the other one equipped with FA-50PL, and another FA-50PL squadron is to be stationed in the 21st TAB in Świdwin.

"We cannot afford to have several pilots who can perform combat duty at express speed. In order to maintain combat duty for a long time, we need to have a large group of pilots. So at the moment, the priority for us is the ability to train pilots in Poland," stressed FA-50GF pilot.

All the planes are two-seaters, so currently the personnel of the 23rd TAB are in such a comfortable situation that the pilots really do fly a lot. Anyone who is available can practically perform several flights. However, it is often the case that only one aircraft is needed to complete a certain training element, and sometimes three or more, so one day two-three pilots can perform several training flights, and sometimes the entire team works only for one to complete a designated training task.

"As for the technical staff, we are already training them in Poland in their entirety and we are striving to ensure that the base has the opportunity to train flight personnel in Poland as well," adds Lt. Col. Boruta.

Future operations

The main task of the 23rd TAB is to perform combat duty. "The FA-50GF is capable of this and can perform combat duty. The aircraft meets the requirements of the Air Force and will certainly replace the MiG-29 and will perform all the tasks that the MiG-29 has performed so far," says the FA-50GF pilot.

Above: ***The great advantage of the FA-50GF is its flight endurance. Carrying 3 fuel tanks, the aircraft is able to perform a 3-hour flight, including flying to the place where the task is to be carried out, possible patrolling of the space and return***

Below: ***Two FA-50 squadrons are to be stationed in Mińsk Mazowiecki - one equipped with GF version aircraft, and the other - PL. The third squadron, equipped with FA-50PL is to be stationed in the 21st TAB in Świdwin.***

Another advantage of the FA-50GF is its flight duration. In the case of the MiG-29, the flight, execution of the task and return could take 1 hour - 1 hour 15 minutes. On the other hand, the FA-50, carrying 3 fuel tanks, is able to perform a 3-hour flight, including the flight to the place where the task is to be performed, possible patrolling of the space and return. So far, no aircraft has performed such a long flight, because there was no such need.

It is known that the 23rd TAB is to be an operational conversion unit, so the FA-50GF will not be used for advanced training together with the M-346 Bielik. The first group of 8 pilots, who completed training in 2023 in Korea, are improving their skills in the country, already on our FA-50GFs. Since mid-October this year, the second, eight-person group of pilots from the 23rd TAB has been training in Asia. The next stages of training, there will

By October 25, 2024, Polish FA-50GFs had completed 618 flights, lasting a total of over 610 h

be two more, will include mixed groups, with Su-22 *Fitter* pilots from the 21st TAB from Świdwin, and MiG-29 pilots from the 22nd TAB.

"We need pilots already prepared for training on the FA-50 so that they can take care of the main task as soon as possible, which is the protection of Poland's air borders. There will also be training in ground target strikes – this aircraft has a huge range of weapons designed for this purpose and in this respect significantly surpasses the MiG-29," says Lt. Col. Nawrot.

FA-50 pilots will be trained in combat use, including close air support missions, i.e. cooperation with land forces. It should also be remembered that AGM-65 Maverick missiles can also be used to engage the maritime targets.

Prospects for 40 years

The Minsk base has huge prospects, and it will certainly be a place of work for many people for the next 40 years, i.e. the time of use of the FA-50. Ultimately, two squadrons, 16 aircraft each, will be stationed here, and there are plans for a very extensive expansion of the infrastructure.

The maintenance hangar can easily accommodate 6 aircraft at a time, and ultimately – 8. Higher-level maintenance work will be performed there. Mainly, it will be maintenance after 100 and 200 flight hours, but also various types of aircraft improvements on an ad hoc basis. "We have direct contact with the manufacturer, which was not the case with the MiG-29, and because the aircraft documentation is live and changes practically from week to week, various types of maintenance lists are simultaneously introduced, which constantly and continuously improve the functionality and airworthiness of the aircraft and possibly eliminate detected technical defects," says Lt. Col. Boruta.

There is also a department responsible for elaborating air combat assets, comprising four main sections (ammunition, flares and chaffs, bombs and missiles). Armament is not only combat assets, but all equipment installed in the aircraft, i.e. the targeting and navigation system, the entire weapon installation, launchers, pylons. The base has sent 36 investment applications for the construction of a second dispersal zone, a technical squadron hangar, a hangar for servicing the fuel installation, a new QRA zone, an engine workshop, a hush house, new warehouses, etc. It should also be remembered that all buildings will require power, heating, water, etc.

Ultimately, the personnel of the 23rd TAB want to have the ability to improve, for example, damaged compressor and turbine blades, and above all, replace individual modules of the F-404-102 engine, then perform its diagnostics, and above all, perform engine tests, both installed in the aircraft and on a special testbed.

Currently, 5 investments are being implemented. One of them is a priority project, i.e. the construction of a simulator building. Ultimately, the 23rd TAB will have four simulators: 2 for the FA-50GF for basic training (Operational Functional Trainer) and advanced (Full Mission Simulator) and 2 in the same configuration for the FA-50PL. Ultimately, the FA-50GF simulators will be modified to the FA-50PL standard.

In mid-2023, the progress of simulator production for the FA-50GF was estimated at 40%, and the implementation agreement assumes that the first devices are to reach the 23rd TAB in the second quarter of 2025. The process of producing a comprehensive flight simulator takes two years. In addition, the Korean side must obtain the necessary information, e.g. digital maps of the area around the base in Minsk AB, to implement them in the simulator software. **afm**

Below: ***The 23rd TAB maintenance hangar can easily accommodate 6 FA-50GFs at the same time, and ultimately 8. The base in Mińsk Mazowiecki is to be a centre for tactical training and maintenance and repair of aircraft of this type***

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While the F-35 will be the spear of the NATO forces for years to come, fourth-generation aircraft will make up the bulk of NATO fighting forces in Europe USAF

The GENERATION GAME

Mina Adel asks ex-military pilots about the advantages and disadvantages of fighters that defend NATO skies

In the wake of Russia's invasion of Ukraine, NATO's Air Command has taken all necessary measures to secure the eastern flank and maintain air superiority, which has proven to be crucial for resolving conflicts.

NATO's strategy to manage the crisis was based on three elements. First, they deployed fighter formations to frontal air bases in allied countries near the Russian and Belarusian borders, to contain air threats inside Ukraine and practice the relatively new concept – if you believe the US! – of agile combat employment (ACE). Second, they arranged aerial exercises to rapidly prepare for integration during joint offensive combat scenarios, such as Air Defender and Ramstein Flag. Third, and most important, was the careful selection of participating fighter aircraft, which included a combination of modern variants of fourth- and fifth-generation US jets along with advanced fourth-generation European fighters.

Several European countries are operating F-35s, but the bulk of the work defending NATO has been left to fourth- and advanced fourth-generation aircraft. Furthermore, they will continue to do so in the future through more evolved versions.

The main thrust of this feature is to provide a clear picture of the fighter aircraft protecting Europe. *AirForces Monthly* reached out to ex-pilots and aviation experts to assess their capabilities and limitations in future scenarios.

American muscle

The US Air Force (USAF) in Europe relies on three main multi-role jets: the F-16CM Fighting Falcon, the F-15E Strike Eagle and, sometimes, the F/A-18E/F/G Super Hornet/Growler. According to the threat level, these jets are either already present or can be deployed immediately to the European theatre. While they retain the same design as their predecessors, they have undergone many modifications to the structures, avionics and weapons systems. The most recent variants of these jets boast several essential characteristics, including enhanced flight capabilities, advanced technologies for surveillance and tracking, datalinks, long-range weapons and increased survivability in dangerous combat environments.

An F-16 assigned to the 416th Flight Test Squadron flies into position over the Precision Impact Range Area at Edwards Air Force Base, California *USAF/Ethan Wagner*

A Hellenic Air Force F-16C Block 52 from 336 Mira. The HAF has upgraded 30 of its 83 F-16s to Block 72 standard *Ben Stanley Hall*

The **Lockheed Martin F-16 Block 70** is the best version of the Viper to date, purchased in Europe by Slovakia and Bulgaria. It boasts significant capabilities in both air-to-air and air-to-ground roles, thanks to the APG-83 active electronically scanned array (AESA) radar. This radar is superior to older versions in terms of longer-range detection, faster scan times, better tracking and synthetic aperture radar (SAR) mapping. To present the radar data in the best way, the Viper features an upgraded cockpit with a 6in × 8in centre pedestal display (CPD). Structural improvements include a 12,000hr airframe life. For long-range missions, it comes with easily disassembled and installed conformal fuel tanks (CFTs) that can add an extra 3,000lb of fuel, depending on the mission. Technological improvements include the automatic ground collision avoidance system (GCAS), a new mission computer and the Northrop Grumman AN/ALQ-257 Integrated Viper electronic warfare suite (IVEWS), which has been described as a gamechanger for countering modern radio frequency (RF) threats. Meanwhile, the L3Harris AN/ALQ-254 Viper Shield is another option available.

Former F-16CM pilot Shawn Walsh assessed the effectiveness of the Viper: "The F-16 is a versatile aircraft that can fit into an air force's inventory as a complement to fifth-generation fighters or as the lead asset. By adding the F-16 to the futuristic combat scenario, you are getting an upgraded and proven combat aircraft. The Block 70 F-16 comes equipped with many upgrades that will make it effective in air-to-air, air-to-ground and suppression of enemy air defences.

"I don't think a perfect fighter aircraft exists. The F-16 is great at what it does, but it will never be an F-35, just as an F-35 will never be an F-22. Combat aviation is not one-dimensional. An aircraft that excels at offensive counter air (OCA) is unlikely to be the best platform for close air support (CAS). The F-16 has been a jack-of-all-trades for a long time and it does each mission well. But the A-10 does CAS better and the F-22 does OCA better."

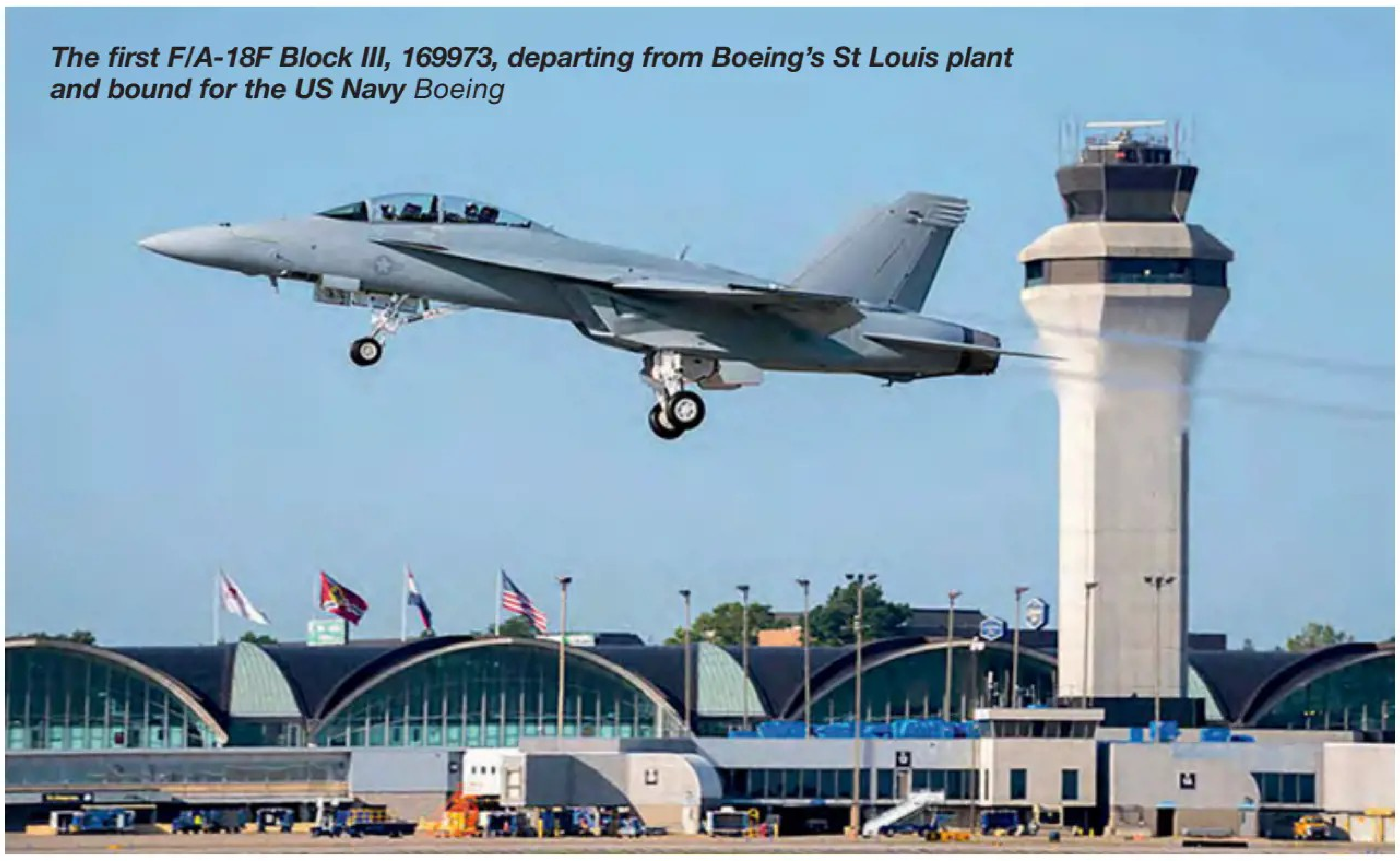
Taking air forces to the next level is the **Boeing F-15EX Eagle II**, which will replace the ageing USAF F-15C/D. This dual-seat heavyweight jet features a magnificent digital fly-by-wire (FBW) system that surprised everyone at the Dubai Airshow in 2023 and Farnborough in 2024. Its General Electric F110-GE-129 engines, combined with the F-15's air induction system, allow it to reach nearly Mach 2 after climbing to 40,000ft with 12 AIM-120 advanced medium-range air-to-air missiles (AMRAAMs). The APG-82 AESA radar offers greater search coverage and faster target processing compared to older derivatives, making it a real monster.

The advanced cockpit includes a 10in × 19in touch display for both the pilot and the weapons system officer (WSO) in the rear seat. There is also the small matter of housing one of the fastest computers in the world: the Advanced Display Core Processor II (ADCP II). Finally, the Eagle passive/active warning survivability system (EPAWSS) provides both offensive and defensive electronic warfare options for the pilot and aircraft to evade

An F-15EX Advanced Eagle laden with 16 CATM air-to-air missiles, consisting of eight AIM-120 AMRAAMs and eight AIM-9X Sidewinders *Boeing*

Qatar is one of the nations that has taken on a variation of the F-15EX. In QEAF service, it is known as the F-15QA Ababil Ben Stanley Hall

Left: ***Two F-15EX Eagle II fighters returning from a test mission over the Gulf of Mexico on August 2, 2023*** *USAF/TSgt John McRell*



The first F/A-18F Block III, 169973, departing from Boeing's St Louis plant and bound for the US Navy *Boeing*

and penetrate integrated air defense systems (IADS). These enhancements ensure the F-15EX remains a formidable platform in modern aerial combat.

Daren Sorenson, an ex-F-15E pilot, said: "In my opinion, we often forgo the mass of warfighting capability for the newest generation of technology, at a much higher cost. Many books and papers have been written on the need for stealth technologies, and obviously the F-22 and F-35 have their advantages in operating in contested airspace. However, a common lesson learned from instructing at the USAF Weapons School and Red Flag exercises is not having enough aircraft and warfighting capabilities to meet the operational needs.

"After your first phase of disabling and destroying a modern Integrated air defense system with stealth or stand-off assets and achieving air superiority, you need mass and lots of it to overwhelm your enemy and dominate the battlespace. This is where a fourth-generation aircraft like the F-15EX excels. This platform, combined with a well-trained and proficient pilot and weapons system officer, is almost unbeatable in most modern aerial combat scenarios.

"It builds on an unbeatable history of the F-15 platform and brings the latest generation of avionics, AESA radar, weapons payloads, fuel, electronic attack and countermeasures and two person crew. Combined with a well trained and proficient pilot and weapons system officer, this platform is almost unbeatable in most modern aerial combat scenarios.

"Honestly, I don't think it's possible to make the perfect fighter, because we've learned you can't make a fighter great at everything. If you try, you end up with the F-16—good at lots of things but great at none. What else

Above: ***An F/A-18F Super Hornet, 166926, of VFA-122 seen down low in Rainbow Canyon*** *Joe Campion*

Above: ***A VFA-151 F/A-18E touching down on the USS*** *Abraham Lincoln* ***(CVN-72) with an interesting weapons fit of three CATM AGM-88 HARMs and a single CATM AIM-120 AMRAAM*** *Joe Campion*

does the F-15EX need to be perfect? Short of perfection, obviously having the radar cross-section of the F-35 would be nice, as would having the range of a B-1 and the thrust vectoring and drag coefficient of the F-22."

The **Boeing F/A-18 Super Hornet Block III** is a highly capable fighter and the US Navy is set to acquire 78 of these carrier-borne jets. While none have deployed to Europe yet, they will eventually. The improvements include a more powerful airframe capable of reaching 10,000 flight hours, a reduced radar signature (stealthy coating) and an additional 3,500lb of fuel via two CFTs.

The cockpit features a large 10in ×19in touchscreen in the centre, the distributed targeting processor-networked (DTP-N), which is 17 times more powerful than the previous version, and tactical targeting network technology (TTNT) that allows for instant and accurate sharing of vast amounts of secure data at speeds of up to Mach 8 between fourth- and fifth-generation jets. Additionally, the AN/ASG-34 infrared search-and-track (IRST) can be attached to the 330-gallon centerline fuel tank.

Paul Tremelling, a Royal Navy ex-F/A-18E exchange pilot, said: "The Super Hornet would probably find a role in modern conflicts for a few reasons. The AN/APG-79 radar is phenomenal and could probably overmatch any jamming it was subjected to. It carries formidable anti-radiation missiles (ARMs), which can target any threatening surface-to-air missiles. I reckon the threat in Ukraine has significantly reduced the utility of tactical air – if you cannot attack, either with electronic attacks or ARMs, you are out of the game. Additionally, the Super Hornet can carry multiple air-to-surface weapons.

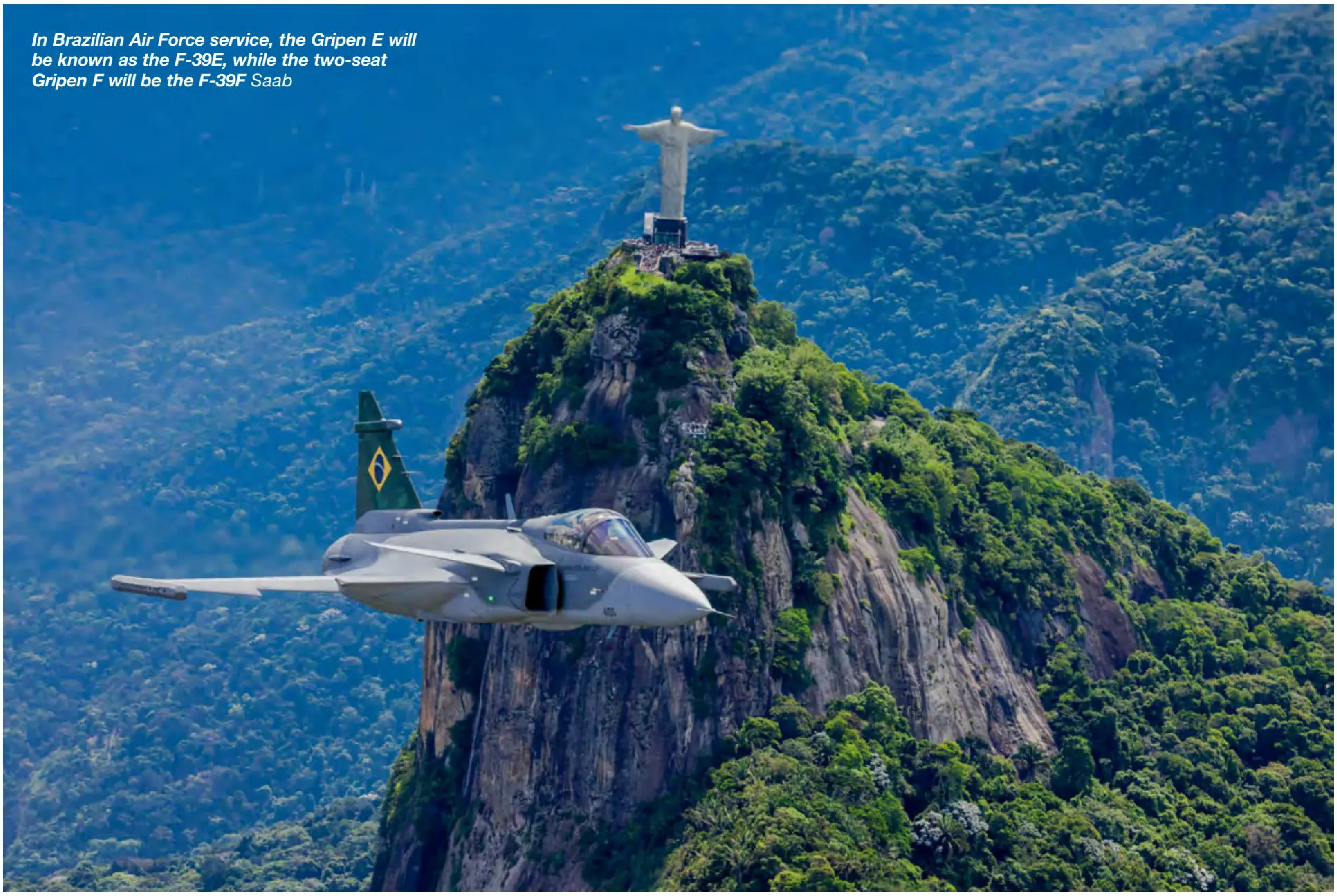
Regarding its limitations, Tremelling explained: "If you want a perfect fighter, it needs to avoid detection to the maximum extent possible to break the enemy kill chain, bring the ability to sense and communicate in the threat environment and have a blend of weapon and platform capabilities to overmatch the threat. In the case of the Super Hornet, it lacks a bit of low observability, which has improved in the Block-3 variant, and a bit of performance. It's absolutely fine within visual range, where it has the joint helmet mounted cueing system (JHMCS) and AIM-9X missiles. It gives up a bit of performance, which is only really a problem in beyond-visual-range. However, the latest integration of AIM-174 very long-range air-to-air missiles (VLRAAM) probably redresses that to a large extent.

"To paraphrase a famous quote: fighter pilots make movies, attack pilots make history! If there was no F-35 available, I'd be more than happy to go to war in an F/A-18E."

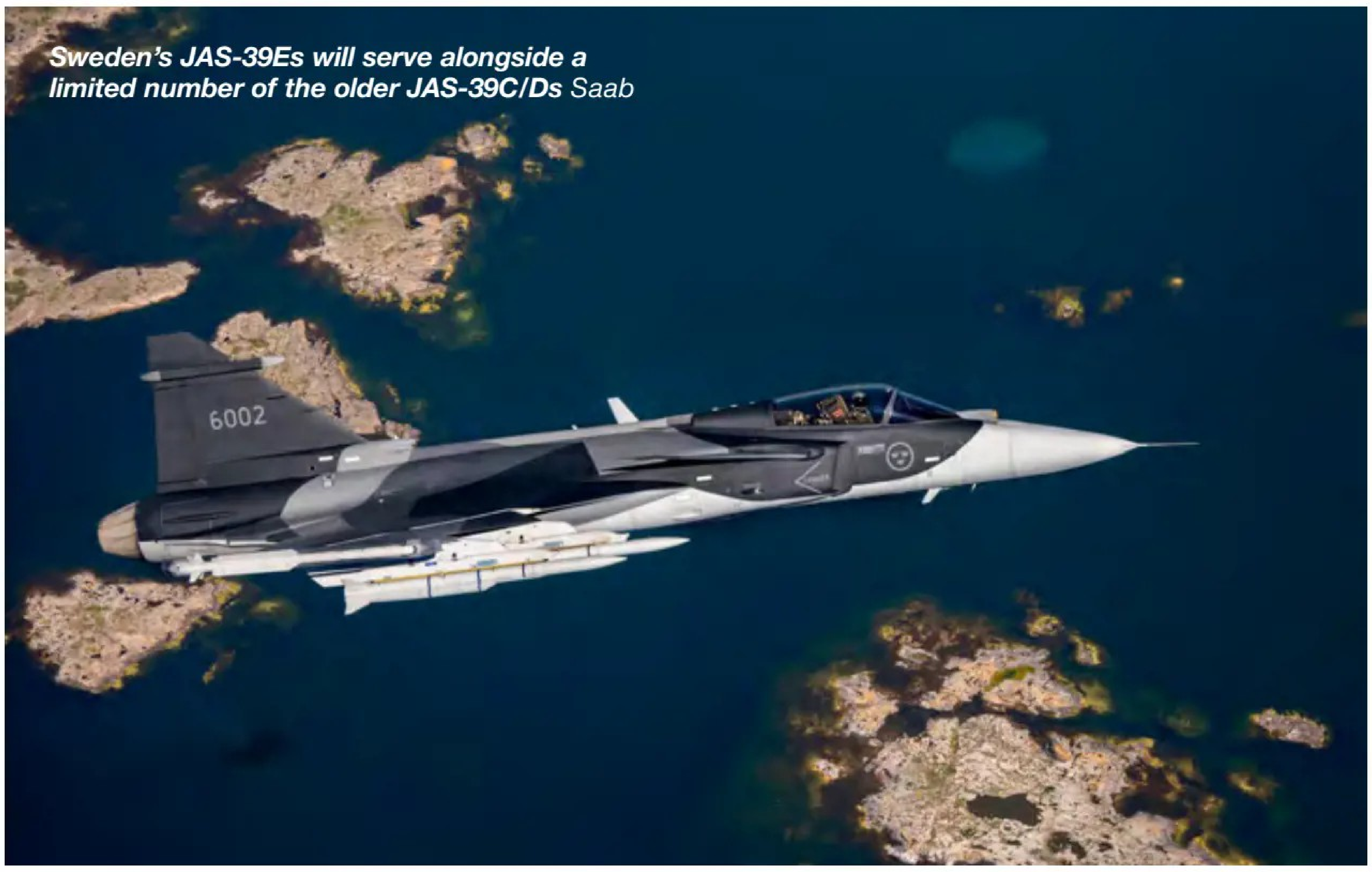
European triple aces

Unlike US aircraft, European companies have developed a new design for advanced fourth-generation aircraft that combines delta wings

Saab Gripen E, 396002, over the islands of Sweden, The Swedish Air Force has ordered 60 of the Gripen E *Saab*



In Brazilian Air Force service, the Gripen E will be known as the F-39E, while the two-seat Gripen F will be the F-39F Saab



Sweden's JAS-39Es will serve alongside a limited number of the older JAS-39C/Ds Saab

and front canards to compensate for the large size required to carry more weaponry and fuel. These aircraft also have the ability to perform multiple missions through integrated smart systems. Today, we have three main fighters: the French Rafale, the European Typhoon and the Swedish Gripen, all of which have next-generation derivatives to complement modern warfare.

The phrase 'fly like a bee, sting like a butterfly' perfectly captures the essence of the **Saab Gripen E/F**, with its compact design and numerous airframe improvements. These include a larger wing area compared to the older C/D versions, enhancing its heavy load-carrying capabilities with 10 hard points and 30% more fuel for extended range. On a technological level, the Gripen E features the Leonardo ES-05 Raven active electronically scanned array (AESA) radar and the Leonardo Skyward G infrared search and track (IRST) sensor. Its integrated cutting-edge electronic warfare system combines a variety of offensive and defensive measures to disrupt enemy efforts while protecting itself, ensuring high survivability. Additionally, it has the unmatched capability to take off and land on highways with a limited logistical footprint. It's worth noting that Sweden has procured 60 new Gripen Es.

Former Gripen C pilot Mikel Grev explained: "What makes the Gripen E unique is its ability to keep up with the latest threats. The Gripen is highly software-driven and software can evolve to address new threats much faster than hardware. There is significant untapped potential in software – we've barely scratched the surface of what can be achieved to enhance a fighter's combat effectiveness. For instance, at Avioniq, we have a decision support system called Rattlesnaq that, with a simple software patch to a fighter, can increase its combat effectiveness by several hundred per cent in beyond-visual-range scenarios. Yes, you read that right!

"The Gripen E's split software security system is designed to receive updates like Rattlesnaq, keeping the fighter modern for longer and reducing lag against ever-changing threats. While many still focus on comparing thrust, maximum speed and the number of pylons, what truly matters is the ability to avoid being shot down while maximising the effectiveness of fired weapons. This is achieved through collaboration between advanced software and the aircraft operator, not yesterday's hardware."

Grev also emphasized: "Pilots always want more thrust. At least, that used to be true, if only because it made the aircraft roller-coaster more fun. But seriously, what's needed are the best sensors and electronic warfare systems. This might seem to contradict what I said earlier about hardware, but it really doesn't. Hardware is just part of the equation and it's becoming a smaller part as it gets harder to make significant advances with new hardware. What truly matters is the

This RAF Typhoon FGR4, ZK355, is carrying a Spear missile for testing on the Vidsel Range in Sweden *Eurofighter*

signal processing capability of these sensors – and, for that, you need a powerful computer. However, what's considered a powerful computer today will be the equivalent of a pocket calculator tomorrow.

Grev concluded: "The Gripen E has a truly modular and easily swappable computer cluster – not just for mid-life updates every 15 years, but upgrades to the latest specifications every five years or so. These upgrades should use the fastest and most advanced computers available at the time of installation, not the second-to-last generation available at project inception. CPU cycles save lives. More powerful software can be developed, which will significantly enhance both lethality and survivability, more than any hardware advances could in the future."

One of the best air superiority fighters in the world, the **Eurofighter Typhoon Tranche**

Below: ***A trio of Italian Air Force F-2000As from 36 and 4 Stormo, over the ice off the coast of Iceland*** *Eurofighter*

An RAF Typhoon showing its varied armament, consisting of Brimstone and GBU-24 bombs, as well as ASRAAMs and AMRAAMs *Eurofighter*

Dassault plan to pair its Rafale F5 with a Stealthy loyal wingman *Dassault*

The Indian Air Force is one of the nations that operate the Rafale, but it's unclear whether the F5 version will be offered to export customers Dassault

4 is now equipped with the long-awaited Captor-E Mk 2 (ECRS Mk 2), described by BAE Systems as "the world's most capable combat air radar." It enhances the Typhoon's ability to locate and deny the use of an adversary's radar with a powerful electronic jamming attack while staying beyond the reach of threats. To present the new radar data, the cockpit features a 12in x 22in large area display. Additional improvements include the multifunctional digital information distribution system (MIDS) to securely exchange real-time data with other platforms, the Praetorian next-generation electronic warfare system with digital radio frequency memory (DRFM) capabilities, a high-powered electronic attack pod for suppression of enemy air defence (SEAD), and electronic countermeasures (ECM) with increased power for self-protection.

RAF Air Marshal Greg Bagwell, he UK's Joint Force Air Component commander for many military operations, explained: "The Typhoon's physical performance is superb, but without the stealth characteristics of its stablemate, the F-35. It relies on the reach of its weapons and its onboard defensive aid sub-System (DASS) to survive in an increasingly fifth-generation world. Until our F-35s get longer-range weapons, the Typhoon remains our primary means of deep attack missions."

The **Dassault Rafale F-5** is a revolutionary development with an extended airframe life package that hides many magical and lethal tricks. It includes an upgraded version of the RBE2 AESA radar, featuring new synthetic aperture radar (SAR) and ground mobile target indication and tracking (GMTI/T) modes, which enhance the Rafale's ability to produce high-resolution radar imagery at very long ranges. The Rafale's lethality is represented by new weapons, including hypersonic technologies, the ASN4G nuclear missile and the ability to co-operate with unmanned combat aerial vehicles (UCAVs), known as 'loyal wingmen', notably the French stealth nEUROn. Some features are shared with the F-4 variant, such as the Thales SCORPION helmet-mounted display and exceptional connectivity for better data sharing with other platforms.

Pierre Chuet, an ex-Rafale M pilot, said: "To better understand the F-5, there are two aspects in air-to-air combat. A Rafale with an AESA radar plus Link 16, extra fuel tanks and Meteor missiles could prove highly efficient in ambushes against adversary jets getting within a couple of dozen miles from the frontline. In terms of air-to-ground missions, the Scalp missiles and AASM bombs could prove impactful on the frontline. However, the improved version's impact would not be as significant as in air-to-air combat."

Regarding the Rafale's limitations, Chuet stated, "The Rafale wouldn't be a huge game changer— not for several years before getting more capabilities. AASM bombs or even Scalp missiles could be used in SEAD roles, but the platform would not be as impactful as specialized assets. "To have a perfect swing-role jet should have internal bay, having no extra drag below the wings makes a difference, providing more speed, low drag, and a smaller radar cross-section (RCS). However, the next French loyal wingman will help in this, and of course, a pilot from the French Navy." He concluded.

Despite the introduction of fifth-generation aircraft and their critical role in distracting and eliminating opponents, advanced fourth-generation aircraft continue to be indispensable key players. Older aircraft will continue to supplement and assist with their increased armament capacities. NATO and its partners, not just in Europe but also in Asia, have models capable of carrying out any mission with a variety of concepts. Future versions of these jets will undoubtedly be more effective and lethal, capable of taking on adversary jets from both the fifth- and sixth-generations. **afm**

In March 2023, the F4.1 standard was qualified by the DGA, the French defence procurement agency, and the upgrades are ongoing Dassault

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Firsts at Fairford

2025 marks the 40th anniversary of what is now known as the Royal International Air Tattoo making RAF Fairford its home. **Ben Stanley Hall** looks at some of the more interesting first appearances at the world's greatest military airshow

The modern-day Royal International Air Tattoo can trace its lineage back to the 1971 airshow at North Weald, Essex. Organised by a pair of air traffic controllers, Paul Bowen and Tim Prince, and staffed exclusively with volunteers, the airshow was in support of the Royal Air Forces Association. The airshow was held only once more at North Weald, in 1972, before moving to RAF Greenham Common, Berkshire, being staged intermittently between 1973 and 1983. The 1976 show was the first to use the 'International Air Tattoo' (IAT) moniker.

RAF Fairford in Gloucestershire became home to the IAT from 1985 and, initially, it was held every other year, before moving to its now-familiar annual basis in 1993. In 1996, 'Royal' was added to the name of the show after it was endorsed by Her Majesty, Queen Elizabeth II.

Between 2000-2001, RIAT was held at RAF Cottesmore in Rutland due to engineering works at Fairford and in 2008, the show was cancelled due to unprecedented rainfall. The COVID-19 pandemic cancelled two further shows in 2020 and 2021.

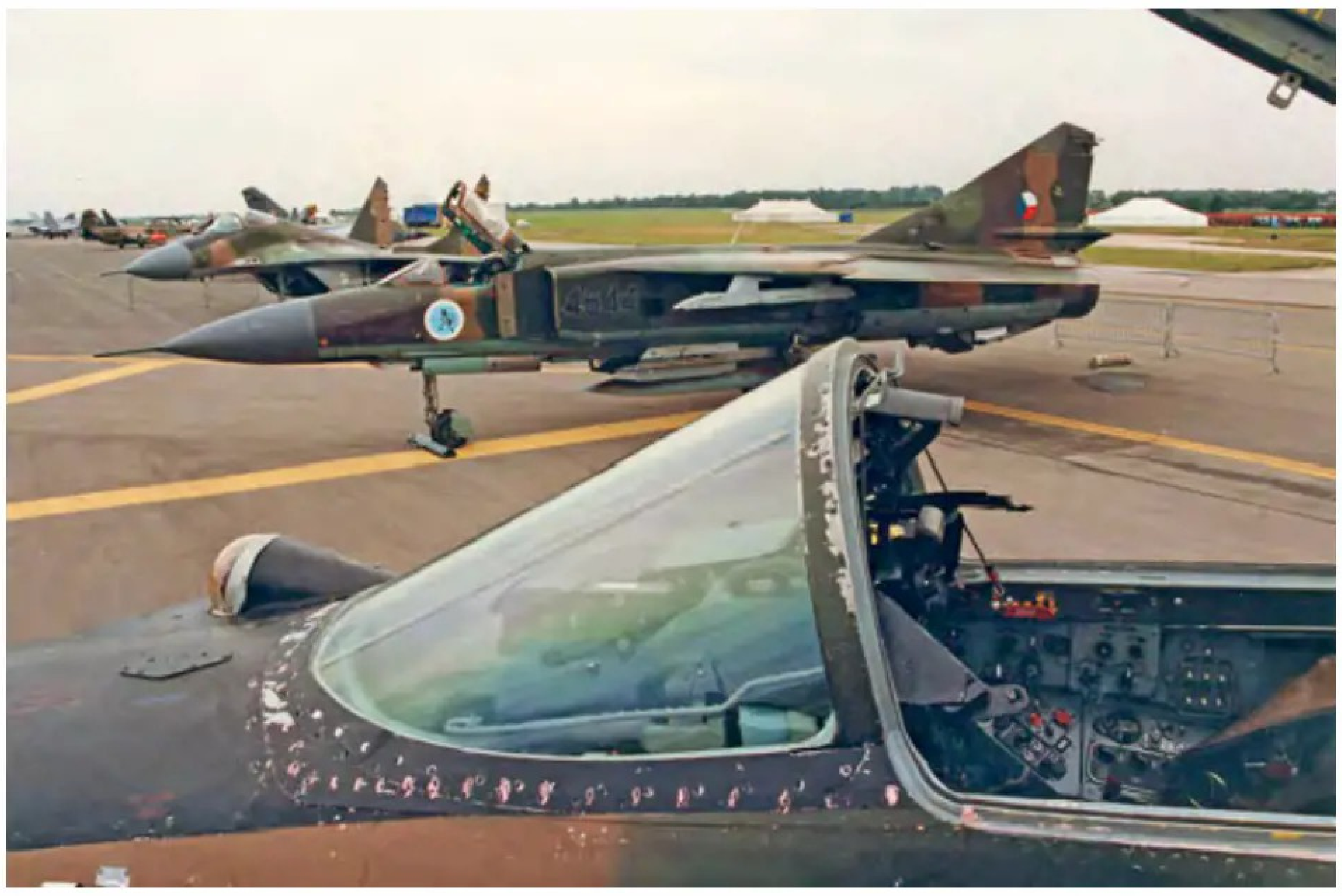
Since its inception, and particularly while at Fairford, special and often unique appearances have graced the event. In this article, and the second part next month, we will look back at some of the most incredible 'first appearances' of aircraft at IAT/RIAT at RAF Fairford. These 'firsts' will be described by one of the show's creators, Tim Prince, and the recent 'voice of RIAT' and its lead commentator, Ben Dunnell.

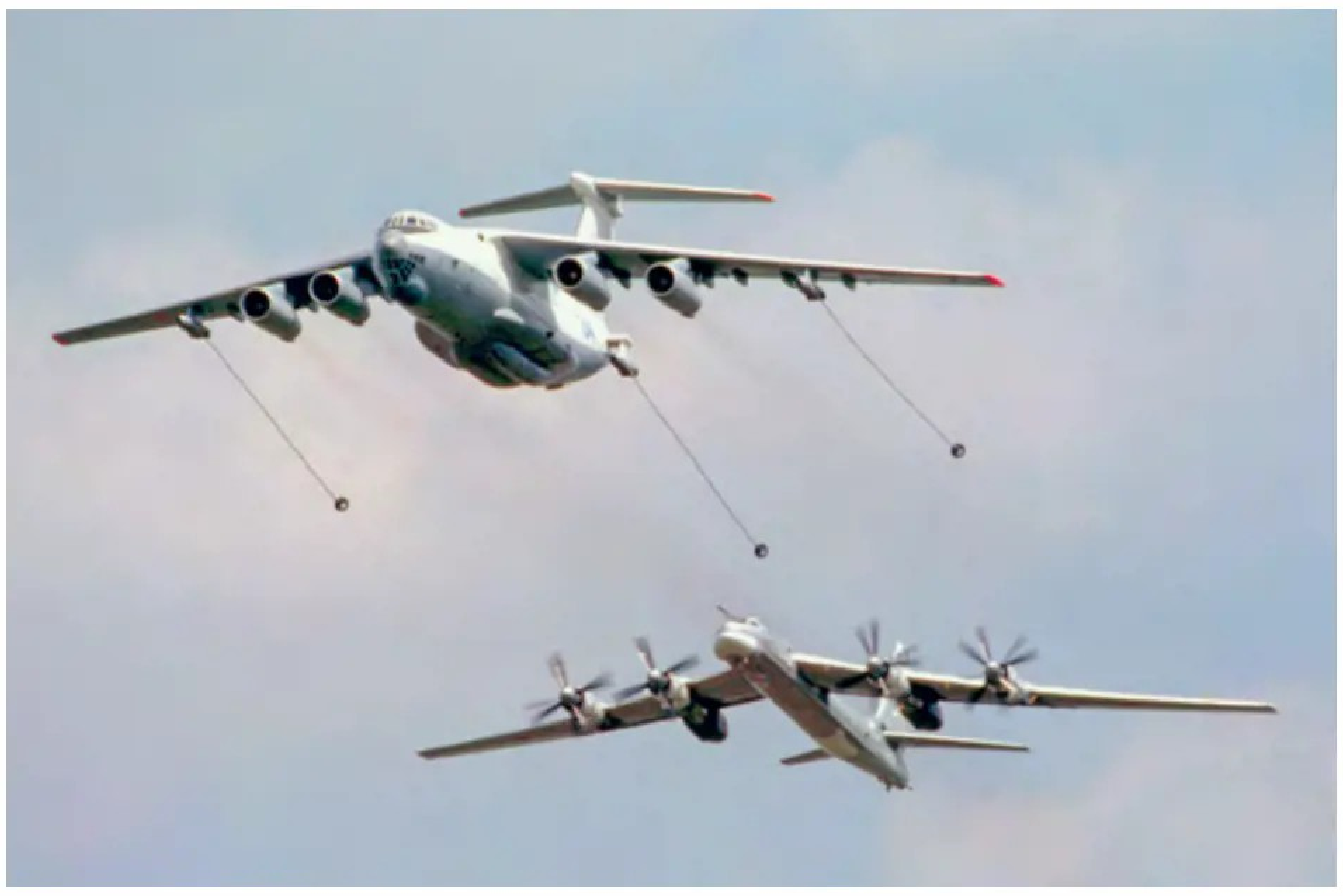
1991 – First UK airshow appearance of an in-service Warsaw Pact combat aircraft

While Eastern combat aircraft such as the MiG-29 and Su-27 had visited before, at Farnborough, these had been manufacturers' aircraft, not from frontline military units. Tim Prince explained: "We had been 'working' the Embassy on an annual basis and the [Russian] air attaché had shown interest in establishing a charity to support his air force on the lines of our then 'owner', the RAFBF [RAF Benevolent Fund]. This resulted in our 1990 show at Boscombe Down enjoying the successful participation of an L-39C and L-410UVP, which led the way for the combat aircraft to participate in IAT91 at Fairford. Indeed, this resulted in us assisting in staging their first 'public' military air show at Kbely in September of that year." The combat aircraft Tim was speaking about were a MiG-23ML *Flogger G*, 4644, and a pair of MiG-29A *Fulcrums*, 5616 and 7501.

Above: **Tu-95 *Bear H*, 20 Black, about to touch down at RAF Fairford. The aircraft hailed from the 182nd Guards Heavy Bomber Air Regiment** *All images Peter March unless stated*

Below: **A pair of Czechoslovak MiG-29As about to touch down on Gloucestershire soil. These aircraft were based at Žatec, belonging to 1. Letka**





1993 – First Western public appearance of a Tu-95 *Bear* and first appearance of an in-service MiG-21 *Fishbed*

Hot on the heels of the thawing relations between the East and West, and with past appearances from Warsaw Pact nations at IAT91 and ATI at Boscombe Down in 1992, the bar was raised even further. Ben Dunnell states "Even though aircraft from Soviet/Russian manufacturers had displayed at Farnborough, and the Russian LII flight research institute's Su-27 had made such a memorable appearance at IAT's Boscombe Down event in 1992, there was surely no more potent symbol of the warming in relations with the old Warsaw Pact foe than the sight of the Russian Air Force Tu-95 *Bear* settling onto Fairford's tarmac for the 1993 show. The frontline heavy strategic bomber that, for decades, had been seen by countless RAF fighter pilots on quick reaction alert intercepts around Britain's boundaries, but never actually on our soil – it was an incredible moment. What a sound, too! Sadly, those days of friendship now seem very far off."

Tim Prince added: "Flushed from the success of Warsaw Pact aircraft taking part at Boscombe Down and Fairford, we turned our attention to securing a *Bear* through many direct approaches and visits to the Russian Embassy in London. We also 'worked' our Embassy in Moscow where our request for a *Bear* to attend the Air Tattoo on a United States military air base initially caused just a little amusement/scepticism, but together we made it happen. Discussing the project over dinner in a nearby Cotswolds restaurant with the forward planning team from the 182nd Guards Heavy Bomber Air Regiment was a surreal but illuminating experience. What a treat parking it next to the USAF B-52H at the show!"

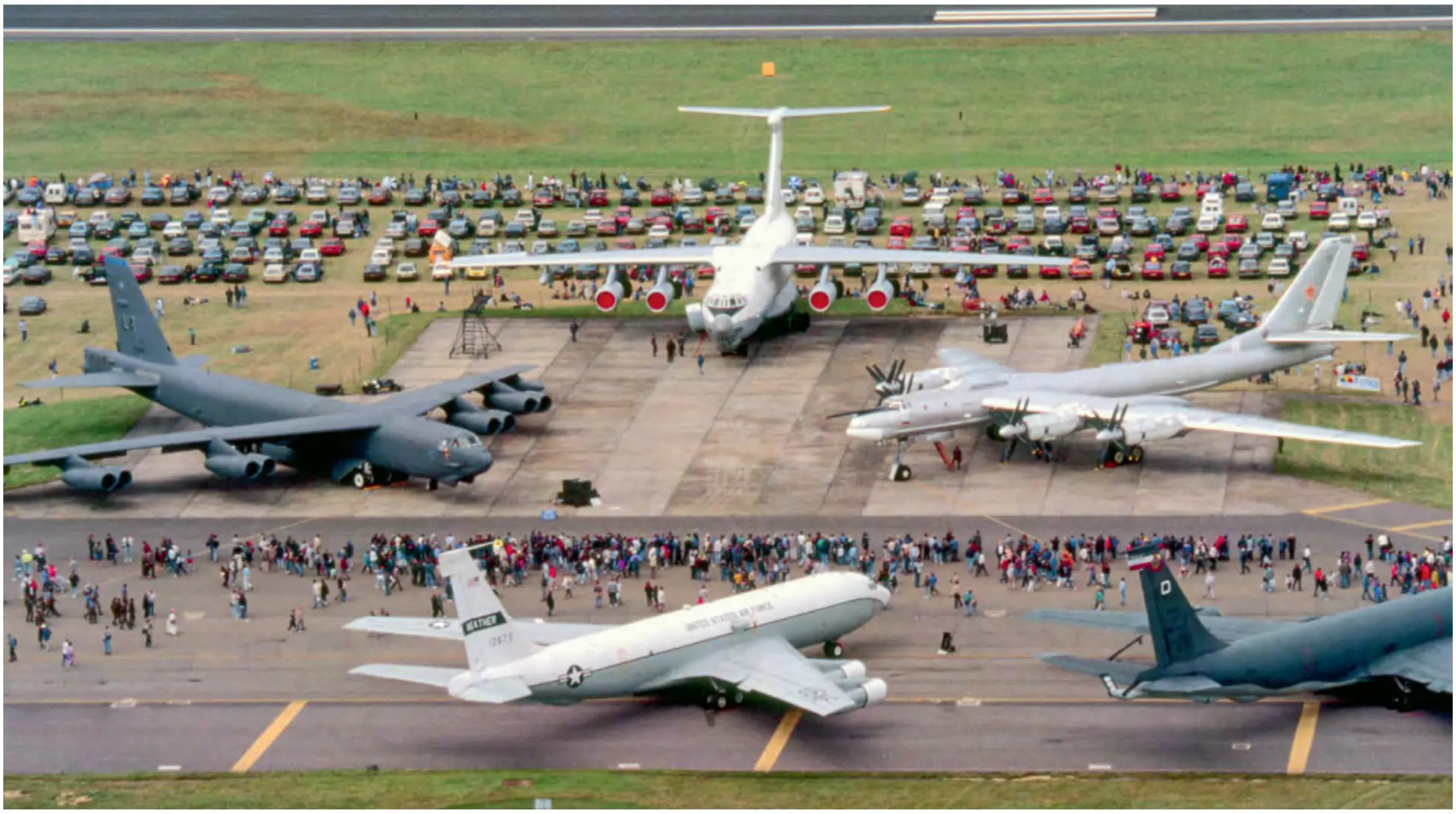
In any other year, the first appearance of a single MiG-21 would receive top billing, let alone four of them in the flying display, known as the Sky Hussars. But with the *Bear's* first appearance, the diminutive MiG takes second stage, although no less important or impressive. Ben Dunnell said: "A host of ex-Warsaw Pact combat types made their British in-service airshow debuts at the Air Tattoo around this time, but – *Bear* aside – the most important had to be the Hungarian Air Force MiG-21s, making up for the non-appearance of the expected Czechoslovak examples at Boscombe Down a year previously. This was the quintessential Cold War Eastern Bloc fighter, and we were treated to four of them giving a formation and dogfight display."

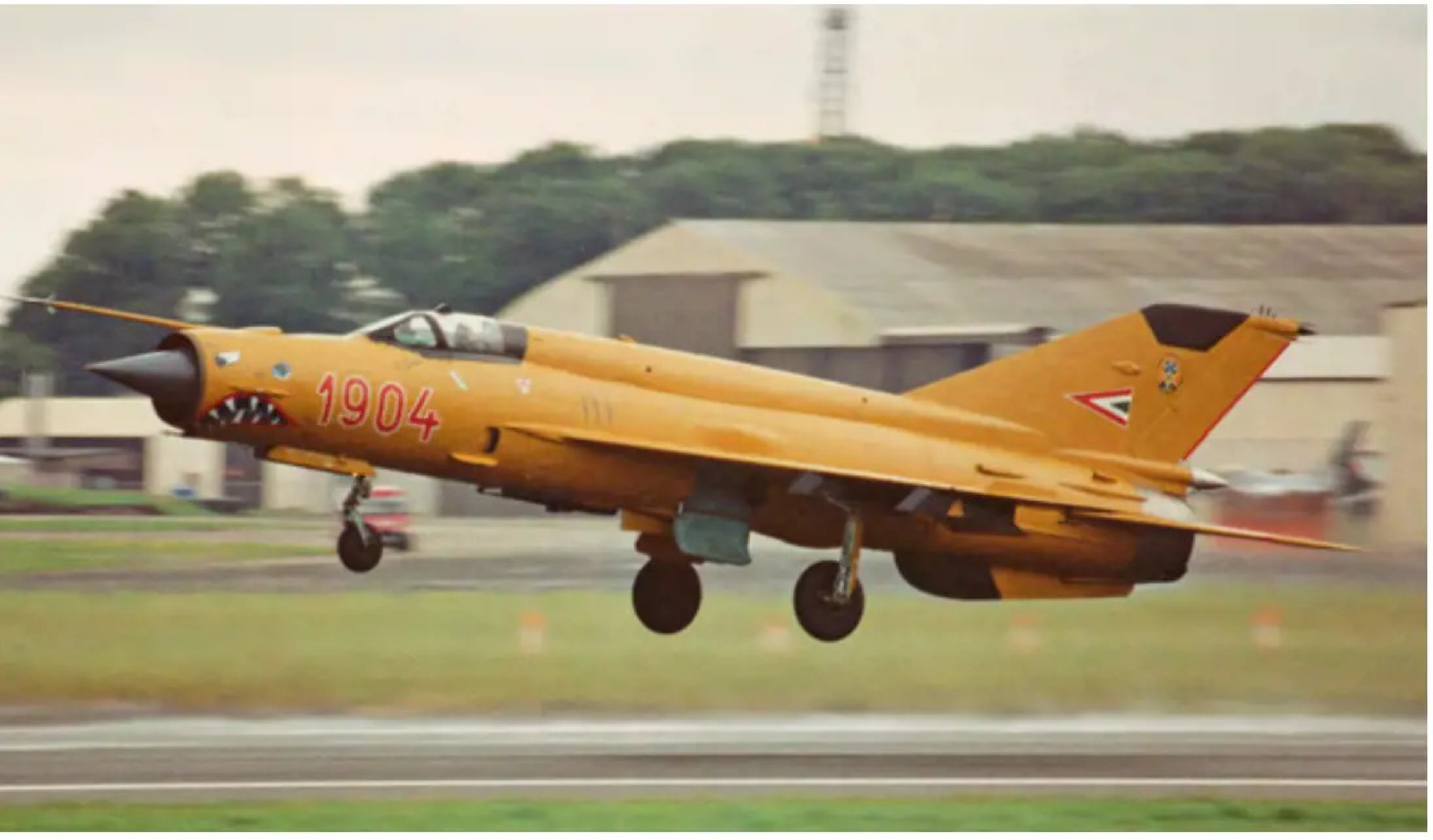
Tim added: "A lot of work went into the 1993 Air Tattoo where we celebrated the 75th anniversary of the RAF. Paul Bowen took a small team of volunteers to Hungary to negotiate the participation where his love of tobacco seemed to

Above left: **Taken from the steps of MiG-29, 7501, the other two combat types can be seen, with the MiG-23ML in the foreground and the second MiG-29 behind**

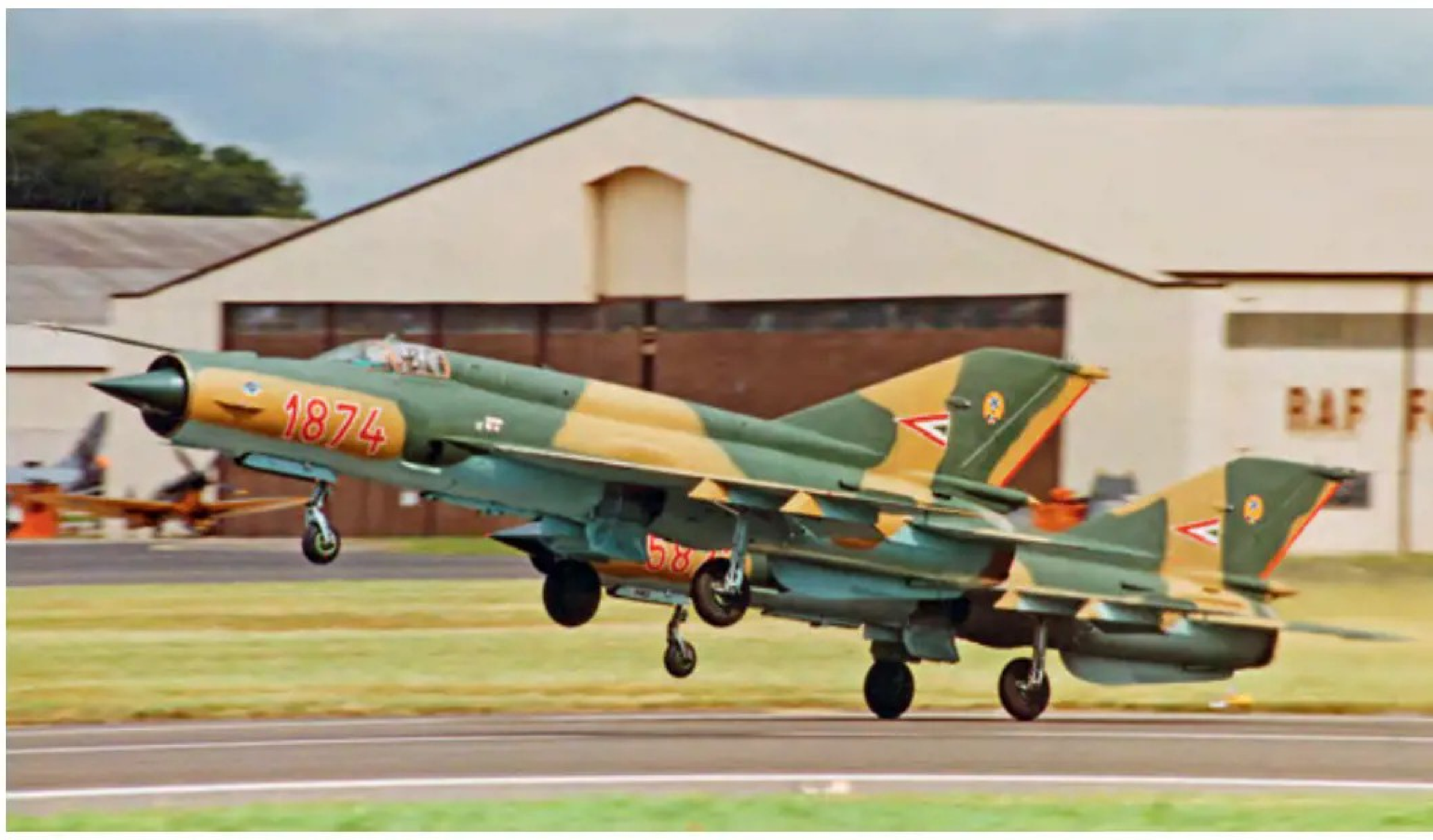
Above: **On the Friday before the weekend show, the mighty Bear took to the skies along with the Il-78 Midas tanker and provided a mock air-to-air refuelling flypast**

Below: **An unlikely sight for many years, and maybe just as unlikely now, but on one weekend in 1993, a Bear and a 'BUFF' shared a ramp together at RAF Fairford**





'Cápeti' powering off Fairford's runway to make up the Hungarian Sky Hussars' four-ship demonstration with the legendary MiG-21 *Fishbed*



Two of the four MiG-21s belonging to the Hungarian Air Force's Sky Hussars demonstration team. All four MiGs came from 31. 'Kapos' Harcászati Repülo Ezred (31.HRE)

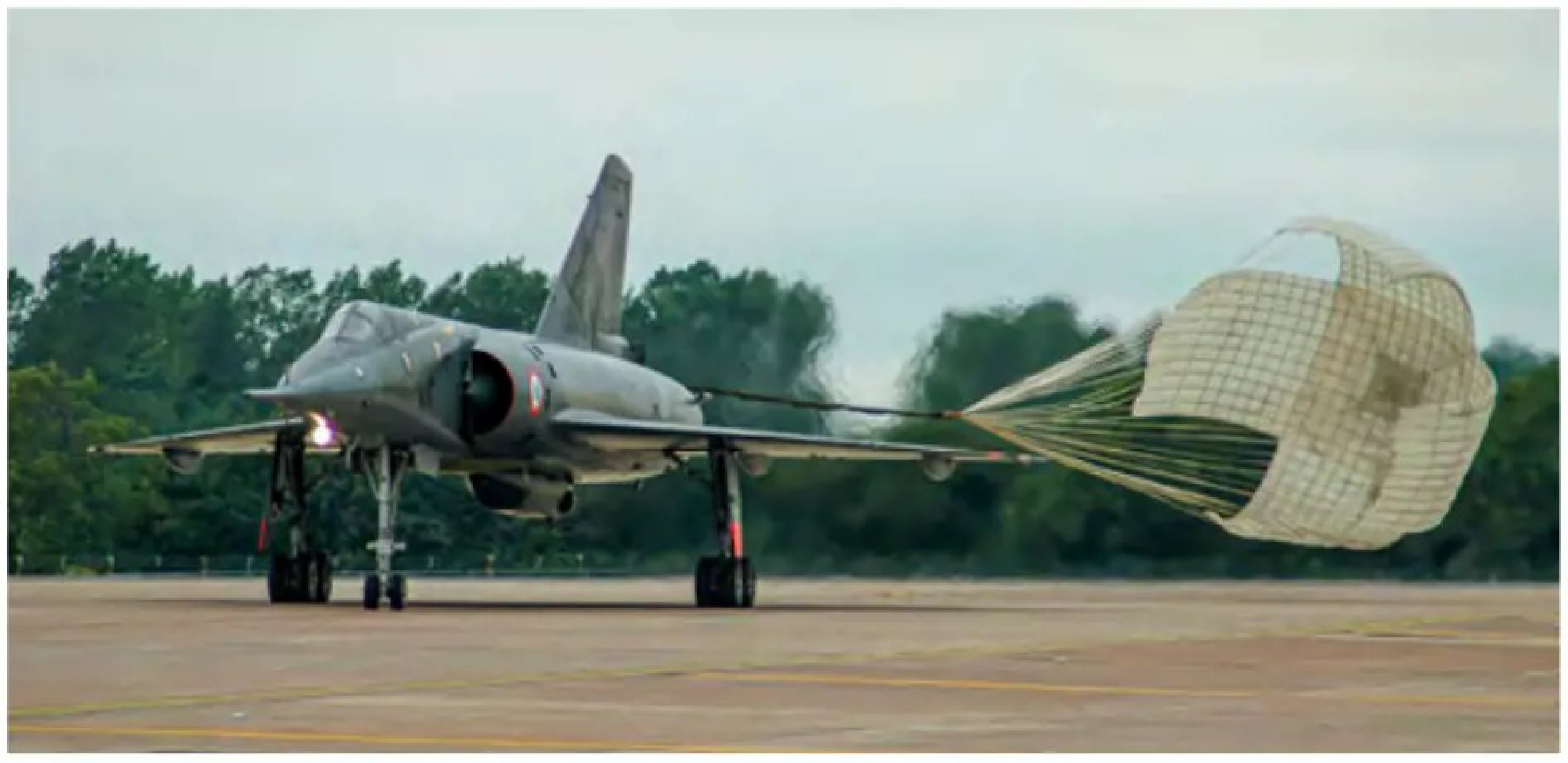
ring true with the one *Fishbed* in pseudo 'Camel' colour scheme!" The aircraft Tim referred to is MiG-21bis *Fishbed N,* 1904, which received a special shark paint scheme in 1992. It was named 'Cápeti' (Peter Shark) after a popular cartoon character of the time and used as the enemy of the Sky Hussars, during the air combat segment of their display.

1994 – First UK show appearance of the Dassault Mirage IV

While the French Air Force had always been a great supporter of the UK airshow scene, one aircraft in particular had eluded organisers… until the 1994 IAT. The Mirage IV had entered service in 1964 in the nuclear strike role, possibly the reason it never attended a UK airshow until 1994, at which time it was only two years away from being withdrawn from the nuclear role entirely. This example came from 1/91 'Gascogne', based at Mont-de-Marsan. Ben said: "It seemed as if we'd never see a Mirage IV at a British show. The mighty French Air Force nuclear strike jet had appeared in UK skies during exercises, but never at a public event. Finally, the type – now in the reconnaissance role – changed that at IAT 94. They were regulars thereafter – what a shame, though, that we never enjoyed one in the flying programme..."

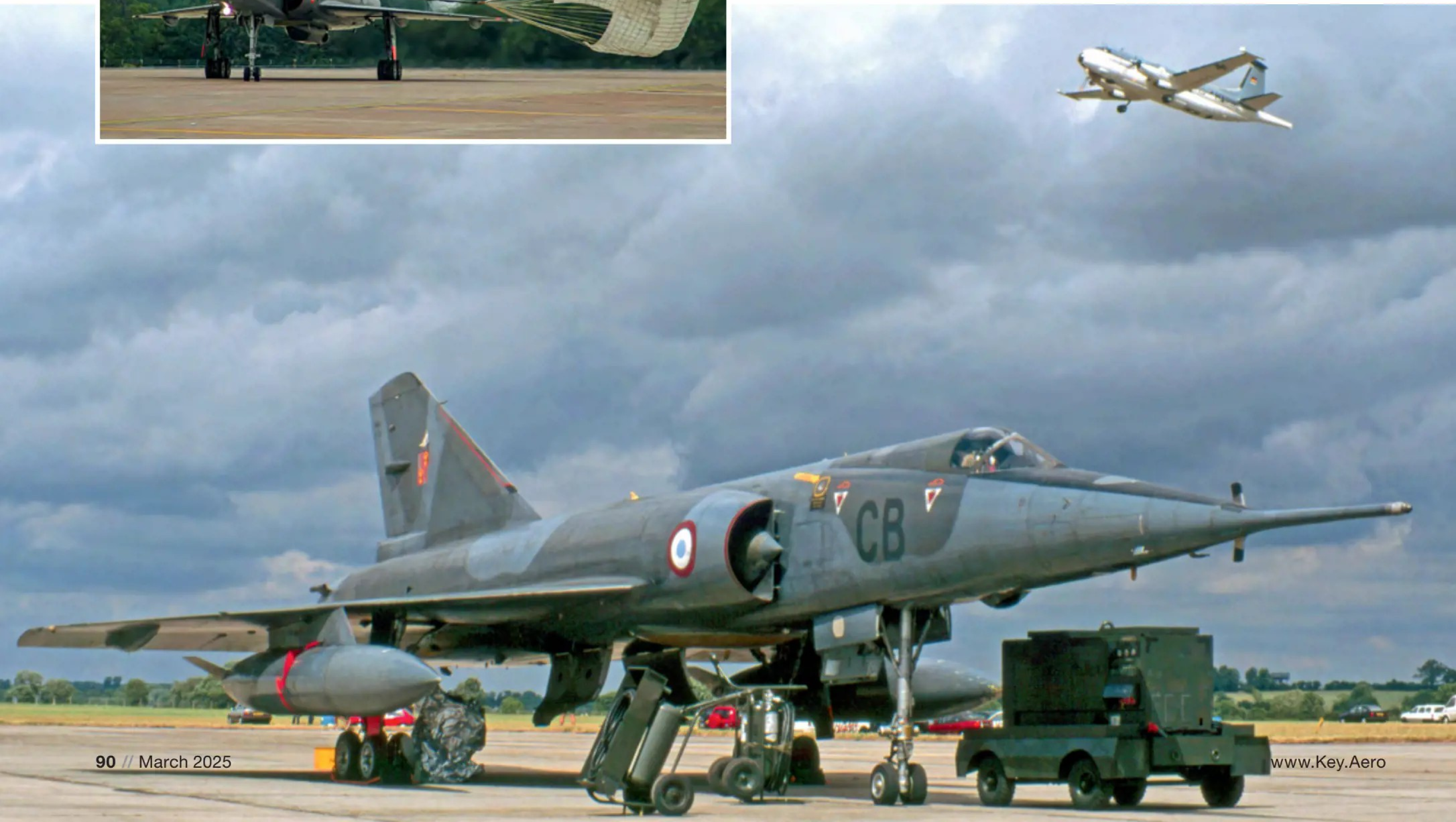
It had been described by President de Gaulle in 1963: "We don't have fighter aircraft, we have fear-inducing aircraft." Talking of how much effort it took to lure the French into sending their jewel, Tim said: "Despite many requests over the years to secure this stunning aeroplane it took a visit to Paris, organised by our volunteer Derek Morter [of Blue Herons fame], so we could take the French Air Force air show participation manager out for dinner. It was a good opportunity to thank him for the excellent French military participation over the years and he kindly made it happen."

Next month, we shall look at other 'firsts' at IAT/RIAT, and announce a competition where you have the chance to win a pair of tickets to this year's Sunday show day at Fairford, to be part of the celebrations of IAT/RIAT calling Gloucestershire its home. **afm**



Left: **Taxiing in on the western end of the Fairford runway is the Armée de l'air Dassault Mirage IVP, 55/CB. The aircraft arrived directly from its home base of Mont-de-Marsan and belonged to Escadron de Bombardement 1/91 'Gascogne'** Glenn Stanley

Below: **Initially conceived to fly high and fast to deliver a nuclear bomb onto a Soviet city as the IVA, a number of aircraft were upgraded to IVP (penetration) standard and its mission profile changed to low-level nuclear strike. This is an IVP standard aircraft and is on display at the Mémorial Charles-de-Gaulle at Colombey-les-Deux-Églises**



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Sayonara C-1

18-1031 receives a water cannon salute following its final flight

After 50 years of service, the venerable Kawasaki C-1 transport aircraft is in the twilight of its career and the Iruma Air Festival, held on November 3, offered a chance to say a final thank you and goodbye to this Indigenous workhorse. **Tom Jones** was in attendance

Following a five-year hiatus (not including 2022 where limited numbers were granted entry to a scaled-back event), 2024 saw the show return and over 200,000 spectators were expected. This gave all in attendance the chance to celebrate the 70th anniversary of the Japan Air Self Defense Force (JASDF). Following torrential rain the day before, thankfully the weather gods blessed the organisers with wall-to-wall sunshine on the show day.

Iruma is home to several squadrons operating various aircraft, most of which were on display on the ground and in the air. Sadly, however, the two YS-11EBs of the Electronic Intelligence Squadron were positioned opposite the crowd line on the far side of the airfield, where they stubbornly remained for the duration.

Joining the locally based aircraft were several visitors, including a C-130H from the 401st Tactical Airlift Squadron at Komaki, an F-15J from 303 Squadron ‘Fighting Dragons’ based at Komatsu, painted in the special JASDF 70th anniversary scheme, and the highlight for many, the silver Kawasaki C-1 FTB assigned to the Air Development and Test Wing at Gifu.

The show was opened by the unique and wonderfully charismatic Kawasaki EC-1. A development of the base C-1, this aircraft performs electronic warfare training duties for the JASDF. It performed a couple of flypasts, including a dramatic tight turn over the spectators gathered in the eastern enclosure, then a missed approach before returning to land.

This was followed by a sedate display from a CH-47J of the local Air Rescue Squadron and a rather more flowing effort by one of the U-680As of the Flight Check Squadron. A quartet of Kawasaki T-4s from the Central Air Command Support Squadron performed a routine of solo and formation passes. Finally, a trio of aircraft from the 402nd Tactical Airlift Squadron, led by a U-4 performed several flypasts, including an energetic racetrack pattern flown by a Kawasaki C-2.

This gave way to a lunch break before the highlight of the day for many – The Blue Impulse – took to the stage. The team are held in high regard and the reaction from the spectators at their manoeuvres, especially the pairs crossings, could make the pilots of the Red Arrows turn green with envy. Even the author got caught up in the moment and joined in with the crowds giving a round of applause to the engineers as they made their way past. The pilots are known as the Dolphin Riders due to their T-4 mounts resembling dolphins (if you squint, hard). They put on a great display, with aircraft appearing from all angles and in a variety of formations, showing off the agility and power of the T-4.

The show was brought to a close by a pair of C-1s which included the final flight of 18-1031. Deliveries of the C-1 to the JASDF started in December 1974 and only 31 were constructed. #031, the final C-1 built, was one of only five C-1s still operational, including the prototype C-1 FTB and EC-1, and all of them were present at the show. An initial pairs

The prototype C-1 FTB 28-1001 returning to Gifu following the show flypast was followed up by a spectacular couple of individual passes as the aircraft appeared from behind the control tower to give the photographers some beautiful top-side angles. Before landing, the aircraft came back through, fast and low, and pulled up into a wing-over before joining the circuit.

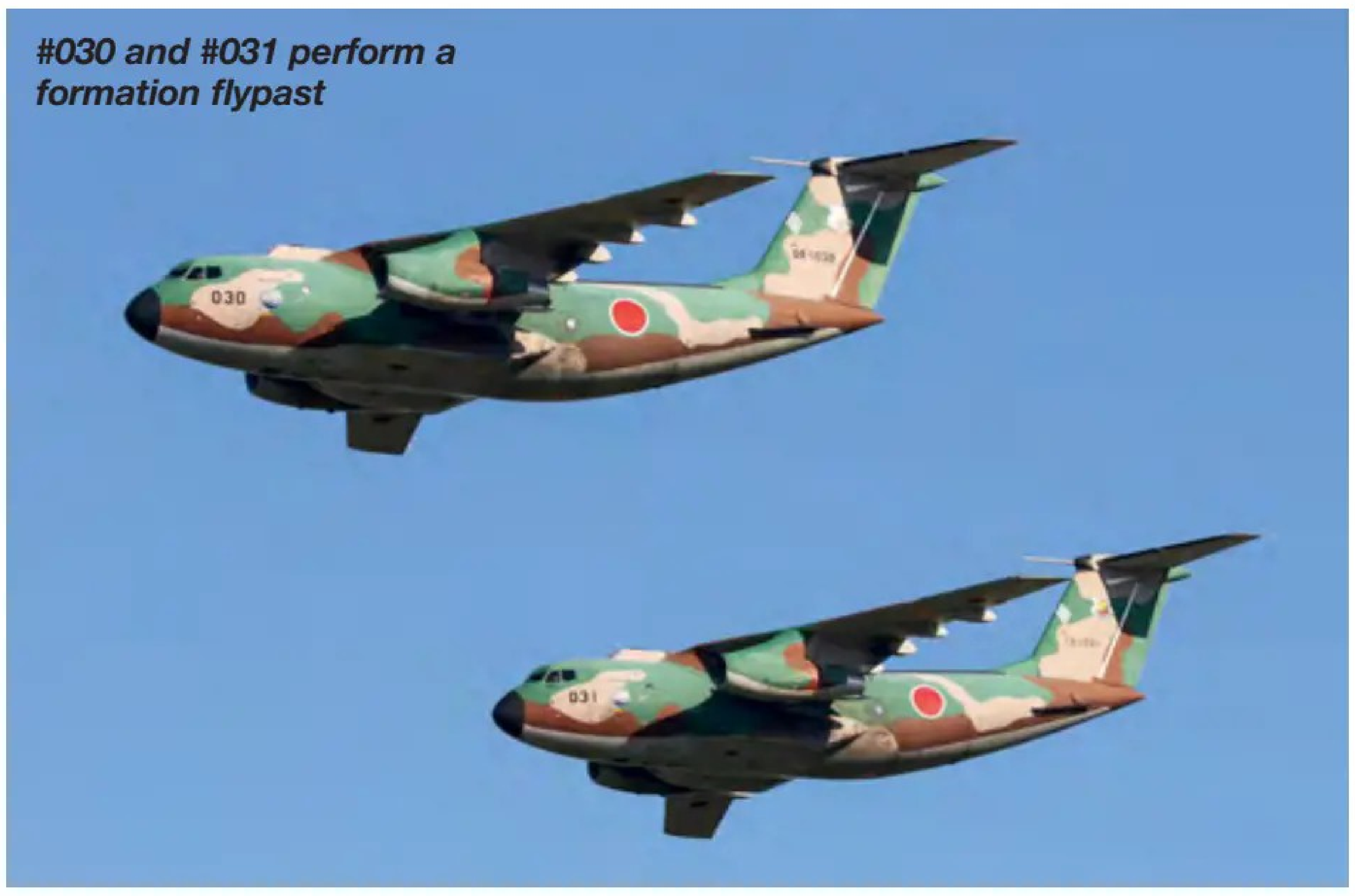
Finally, as #031 taxied into its parking space on the ramp, it was given a water cannon salute and the tune to *Auld Lang Syne* was played over the PA as its engines were shut down for the last time.

Due to restrictions in the Japanese constitution, the C-1 was an aircraft that never ventured very far outside of Japan. So, those who wish to see them before they're retired will need to be quick and get themselves to Iruma before March! **afm**

F-15J 52-8859 of 303sqn Fighting Dragons in its JASDF 70th anniversary scheme

52-8859
859
FIGHTING DRAGON

U-680A 02-3031 banking over the crowd


#030 and #031 perform a formation flypast

Kawasaki OH-1 Ninja 32637 of the JGSDF, based at Akeno

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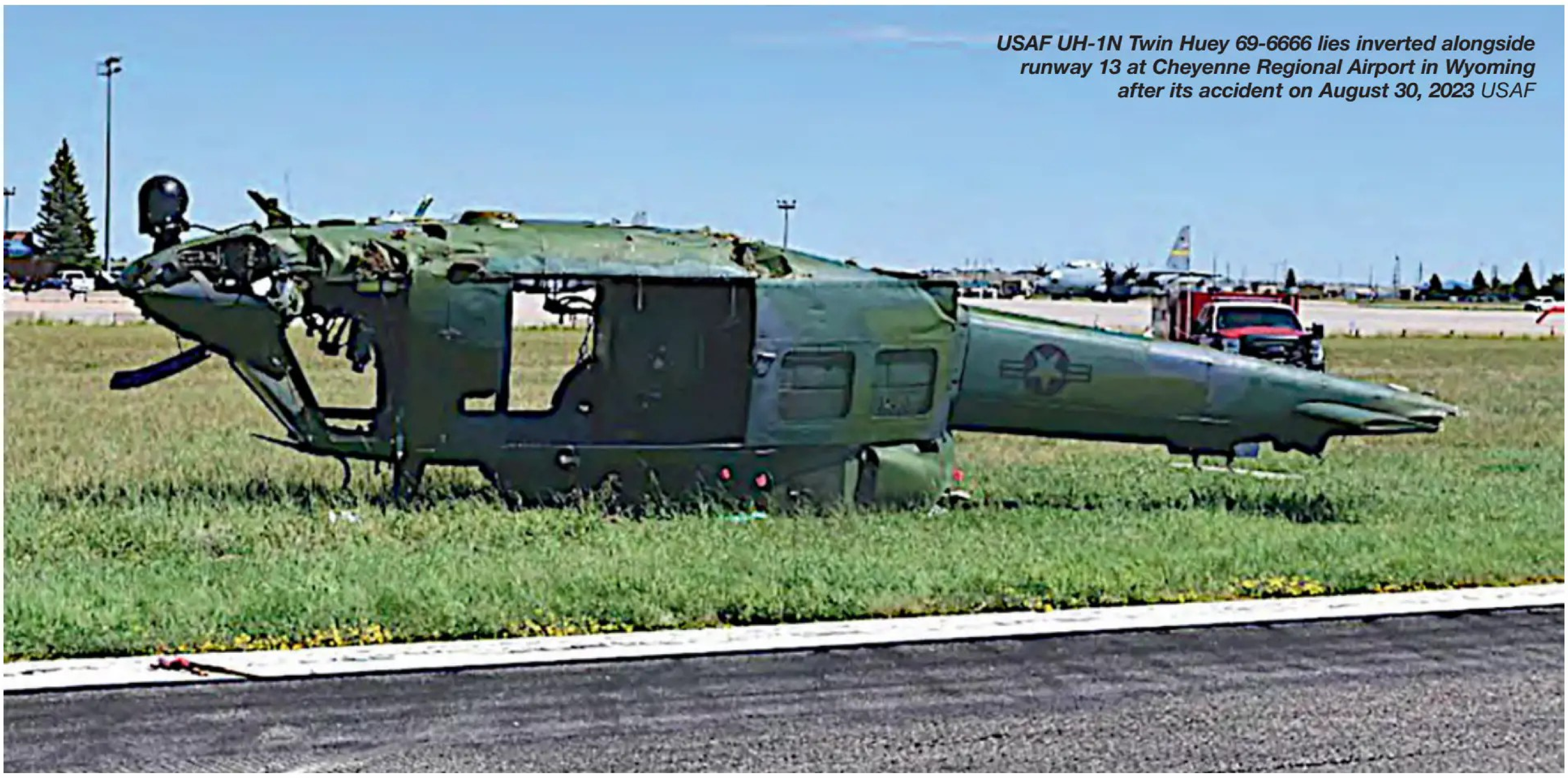
USAF UH-1N accident report released



USAF UH-1N Twin Huey 69-6666 lies inverted alongside runway 13 at Cheyenne Regional Airport in Wyoming after its accident on August 30, 2023 *USAF*

US AIR Force Global Strike Command recently released the Aircraft Accident Investigation Board report into the crash of a UH-1N Twin Huey on August 30, 2023 (see *Attrition*, November 2023). The identity of the helicopter involved, which was previously unknown, is confirmed in the report as being 69-6666, which was assigned to the 37th Helicopter Squadron (37 HS), 582nd Helicopter Group (582 HG), at FE Warren Air Force Base, Wyoming.

The report, which was made public on November 22, states that the UH-1N landed hard and flipped over during an emergency procedure sortie alongside runway 13/31 at Cheyenne Regional Airport (KCYS), Wyoming. The mishap crew consisted of an instructor pilot, pilot and flight engineer. The emergency procedure sortie was being flown for the pilot to regain currency. He had not flown in more than three months and had exceeded the currency requirements outlined in the Air Force Manual. The mishap resulted in a total loss of the aircraft and the forward looking infrared (FLIR) valued at $5,048,624.00. There was no damage to private property.

The incident took place at both the short take-off and landing (STOL) area on FE Warren AFB and the runway at KCYS. The expected duration of the flight had been was 2.5 hours in accordance with the crew flight authorisation. The crew departed FE Warren AFB at 0925hours local and entered the visual flight rules (VFR) traffic pattern. Prior to engaging in the mishap mission, the aircraft performed an 180° autorotation at 1028hrs, followed by various uneventful manoeuvres. During the course of the autorotation, the crew overcontrolled the aircraft, resulting in excessive right bank, excessive nose low attitude and unco-ordinated flight (being out of trim). This caused a high rate of descent (sink rate). At approximately 680ft above ground level, the instructor pilot cautioned: “Watch your nose down.” At this point, the aircraft had a sink rate of approximately 3,300ft per minute. The pilot stated that after the instructor pilot made this call, he “brought the nose up.” According to the Integrated Data Acquisition Recorder (IDAR), there are no indications the pilot ever made this control input. The sink rate and nose down attitude of the aircraft continued to increase over the next four seconds of the autorotation.

Despite exceeding manoeuvre parameters, the crew failed to identify the need for a power recovery. Instead, they continued to try to salvage the manoeuvre. When the instructor pilot eventually identified the need for a power recovery, they conducted it incorrectly and executed it too late to avoid ground impact. Due to the aircraft’s continued high sink rate, high forward airspeed and lack of power and rotor speed, the MC impacted the ground 20 seconds after the practice 180° autorotation began. It hit the ground to the left of KCYS runway 13, tail boom first, before bouncing between the tail boom and the main landing skids until they both broke off.

When the tail boom departed the aircraft, so did the anti-torque system. This resulted in the mishap aircraft spinning to the right and rolling over onto its left side. The rolling motion caused the main rotor blades to come into contact with the runway three times before separating from the aircraft. After the tail boom broke off, the aircraft rotated 540° and came to rest upside down, just off the left edge of runway 13. All three crewmembers remained trapped in their seats during the impact and rollover, then safely egressed the aircraft.

The Accident Investigation Board found, by the preponderance of the evidence, that the mishap was caused by the instructor pilot’s failure to recognise the need to execute a power recovery in a timely manner. There were two factors that substantially contributed to the accident. First, the pilot’s flight control manipulation when entering the 180° autorotation, which resulted in a high sink rate. Second, the crew failed to correctly execute a power recovery once directed to by the pilot.

Accident Reports

D: Jun 8, 2020
N: US Air Force/388th Fighter Wing
T: F-35A Lightning II
S: 17-5269 'HL'

As previously reported, following its accident on the above date (see *Attrition*, August 2020), this aircraft has been on rebuild at Hill AFB, Utah, as a composite airframe, using the nose section of 10-5015 'EG' (see *Attrition*, February 2024). The latter had been involved in a serious incident on June 23, 2014 (see *Attrition*, August 2014, February 2015 and July 2015). On January 24, 2025, the rebuilt aircraft was flown from Hill to Naval Air Station Joint Reserve Base Fort Worth, Texas, where it parked near the Lockheed Martin facility. Although most of the airframe was painted, the 'new' forward fuselage from 10-5015 was still in green primer and presumably it has arrived at Fort Worth for attention from the manufacturer before returning to service.

D: Dec 9
N: US Air Force
T: MQ-9A Reaper

Following the previously reported crash of this UAV in an area controlled by Syrian Democratic Forces (SDF) near Tell Tamer, Al-Hasakah District, Al-Hasakah Governorate, Syria (see *Attrition*, February), further details have emerged. US defence officials have confirmed that it appears it was mistakenly shot down in a friendly fire incident by the US-allied, Kurdish-led Syrian Democratic Forces (SDF), who saw it as a potential threat. The Reaper was at the time undertaking an Operation Islamic State mission against ISIS. Turkish-backed rebel militias in Syria have been supported by Turkish UAVs and it seems the SDF may have mistaken the MQ-9 as one of these. After the Reaper came down relatively intact, US forces recovered various components from the UAV before intentionally destroying the remainder in situ.

D: Dec 12
N: Airborne Tactical Advantage Company
T: Mirage F1CT
S: N610AX

The aircraft, callsign 'Strike 72', suffered an in-flight hydraulic failure and made an emergency landing with no flaps or slats at Naval Air Station Joint Reserve Base Fort Worth, Texas. It was not reported whether the Mirage sustained any serious damage.

D: Dec 18
N: Russian Air Force
T: Kamov Ka-52

This helicopter was destroyed when it crashed at an unspecified location in Russia. Both crew members were killed. The cause is unconfirmed but preliminary reports suggest it was hit by friendly fire from Russian air defences.

D: Dec 20
N: US Marine Corps/HMH-466
T: CH-53E Super Stallion
S: 162518 'YF-518'

During a local training mission from Marine Corps Outlying Landing Field (MCOLF) Camp Pendleton (Red Beach Airport), California, at approximately 1611hrs local time, this helicopter experienced an in-flight engine fire. The aircrew conducted emergency procedures and safely put down the CH-53E at a landing zone on Marine Corps Base Camp Pendleton between Interstate 5 and Stuart Mesa Road. All four crew members were able to exit without injuries before the fire took hold and engulfed the helicopter, which was destroyed, despite local and USMC responders eventually extinguishing the blaze.

D: Dec 22
N: US Navy/VFA-11
T: F/A-18F Super Hornet

While taking part in a sortie as part of Operation Poseidon Archer, against forces of Ansar Allah (Houthis) in Yemen, operating from the aircraft carrier USS *Harry S Truman* (CVN-75), this aircraft was misidentified as hostile. It was then accidentally shot down at approximately 0300hrs local time by friendly fire from the Ticonderoga-class guided missile cruiser USS *Gettysburg* (CG-64) over the Red Sea off Yemen. Fortunately, both the pilot and weapon systems officer were able to eject, although one of them sustained minor injuries. Both were recovered a short time afterwards.

D: Pre-Dec 24
N: Russian Air Force
T: Su-25SM *Frogfoot*
S: RF-10132/'07 Red'

On an unknown date before December 24 this aircraft sustained damage during an in-flight collision with a Zala reconnaissance UAV in Donetsk Oblast, Ukraine. The pilot was able to return to base with the aircraft for a safe emergency landing. Subsequent inspection showed part of the upper nose section missing forward of the cockpit and smashed areas of glazing in the cockpit windscreen and adjacent side panel.

D: Dec 25
N: Ukraine Main Directorate of Intelligence
T: Aeroprakt A-22 Foxbat (modified)

This light sports aircraft, modified as an unmanned attack aircraft, was heading east, approaching the western suburbs of Grozny in the Russian Republic of Chechnya when it was intercepted by Russian air defence forces using a Pantsir air defence system, shot down and destroyed. There was heavy fog in the area at the time.

D: Dec 25
N: Ukraine Main Directorate of Intelligence
T: Aeroprakt A-22 Foxbat (modified)

This light sports aircraft, modified as an unmanned attack aircraft, was destroyed when it was was shot down by Russian air defence forces in Malgobek, Republic of Ingushetia, Russia.

D: Dec 28
N: US Air Force
T: MQ-9A Reaper

This UAV was destroyed when it was shot down by Houthi rebels while flying over Al Bayda Province, Yemen. The Houthis said in a statement that they had downed the Reaper with a domestically made surface-to-air missile while it was conducting a 'hostile mission' over central Yemen. It said this was the 13th MQ-9 intercepted by the Houthi's air defences since the escalation of the conflict in the Gaza Strip.

D: Dec 29
N: Guatemalan Air Force/ Escuadrón Ala Rotativa
T: Bell 407GX
S: 151

After taking off at 0845hrs local time from Base Aérea La Aurora, Guatemala City, this helicopter struck high voltage cables in flight while patrolling the banks of the Chixoy River, crashed and sank into the river at Kilometre 512 of the Northern Transversal Strip, in the Playa Grande neighbourhood, near Ixcán, Quiché. Both crew members, pilot Captain Estuardo González Barrios and co-pilot Lieutenant of Aviation Carlos Álvarez Arias, were confirmed dead when, after several hours of searching, their bodies were recovered from inside the wreckage after it was brought ashore.

D: Dec 31
N: Israeli Air Force
T: CH-53 Yasur
S: 053

While parked on the ramp at Tel Nof Air Base, this helicopter was blown over by strong winds, coming to rest partially inverted on its starboard side and cabin roof. Although it was extensively damaged, no injuries were reported as the Yasur was not in active use at the time and no personnel were near it. Despite the damage, it is expected to be repaired and returned to service.

FUERZA AEREA

Wrecked Guatemalan Air Force/Escuadrón Ala Rotativa Bell 407GX 151 being recovered from the Chixoy River after its crash on December 29
Guatemalan Army

Attrition Report

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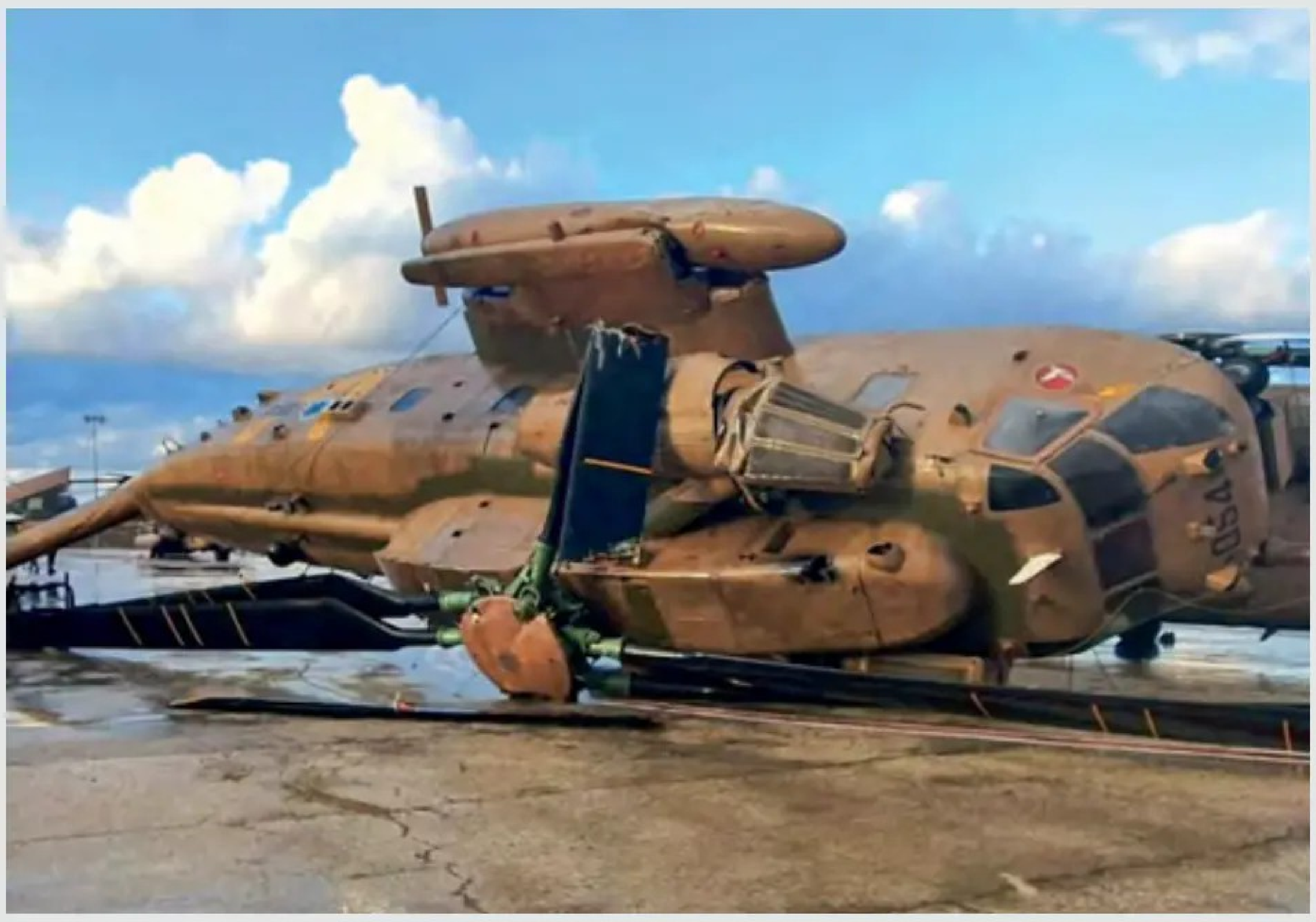
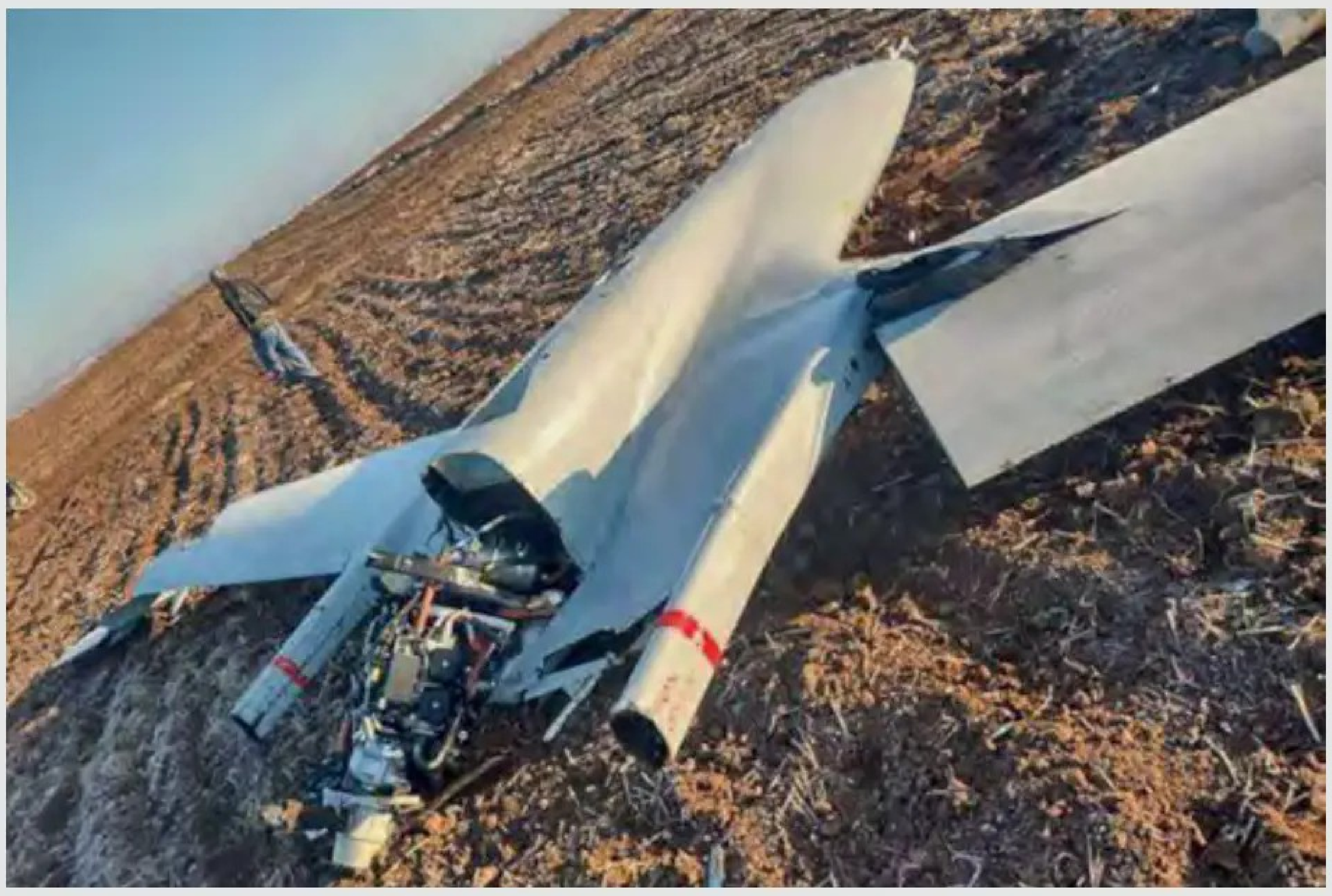


Badly damaged Israeli Air Force CH-53 Yasur 053 after being blown over by high winds at Tel Nof Air Base on December 31 *Via Twitter*



The wreckage of a Turkish Air Force Bayraktar TB2 which was shot down on January 1 near the Qara Qawzak Bridge, in Syria's Aleppo Governorate *Syrian Democratic Forces*

D: Dec 31
N: Russian Naval Aviation
T: Mi-8

During combat operations over the Black Sea off Cape Tarkhankut, western Crimea, this helicopter was successfully targeted and brought down into the sea by a modified R-73 short-range air-to-air missile fired from a Ukrainian Navy MAGURA V5 unmanned surface vessel (USV). The Mi-8 was destroyed and all those on board were killed, although there are conflicting reports on how many personnel were on the helicopter. A second helicopter was damaged during the attack but managed to return safely to an unspecified air base. This was reported to have been the first time a Ukrainian USV had downed an aerial target.

D: Jan 1
N: Russian Air Force/332nd Helicopter Regiment
T: Mi-28

This helicopter was destroyed when it made a hard landing and caught fire at around 1800hrs local time in the Kamensky Raion of Voronezh Oblast, Russia, although the circumstances remain unclear. Both crew members, D Kuznetsov and A Korolev, were killed.

D: Jan 1
N: Turkish Air Force
T: Bayraktar TB2

This UAV, equipped with MAM-L laser-guided bombs, was destroyed when it was shot down at around 0100hrs local time near the Qara Qawzak Bridge, in Syria's Aleppo Governorate. It was reportedly brought down by Kurdish led Syrian Democratic Forces, although the type of weapon used is unconfirmed.

D: Jan 5
N: Indian Coast Guard
T: HAL Dhruv Mk 3
S: CG859

The helicopter, which was based at Porbandar Coast Guard Air Enclave, crashed near the runway at about 1215hrs local time, after experiencing technical difficulties while preparing to land at Porbandar Airport, Gujrat, following a routine training flight. All three crew members, two pilots and an aircrew diver, identified as Commandant Saurabh, Deputy Commandant SK Yadav and Manoj Pradhan Navik, were recovered with severe burns and rushed to hospital in Porbander, where all three were declared dead. The Dhruv was destroyed by the post-crash fire.

D: Jan 7
N: Pakistan Air Force/Sherdils
T: Hongdu K-8P Karakorum
S: 08-09-821

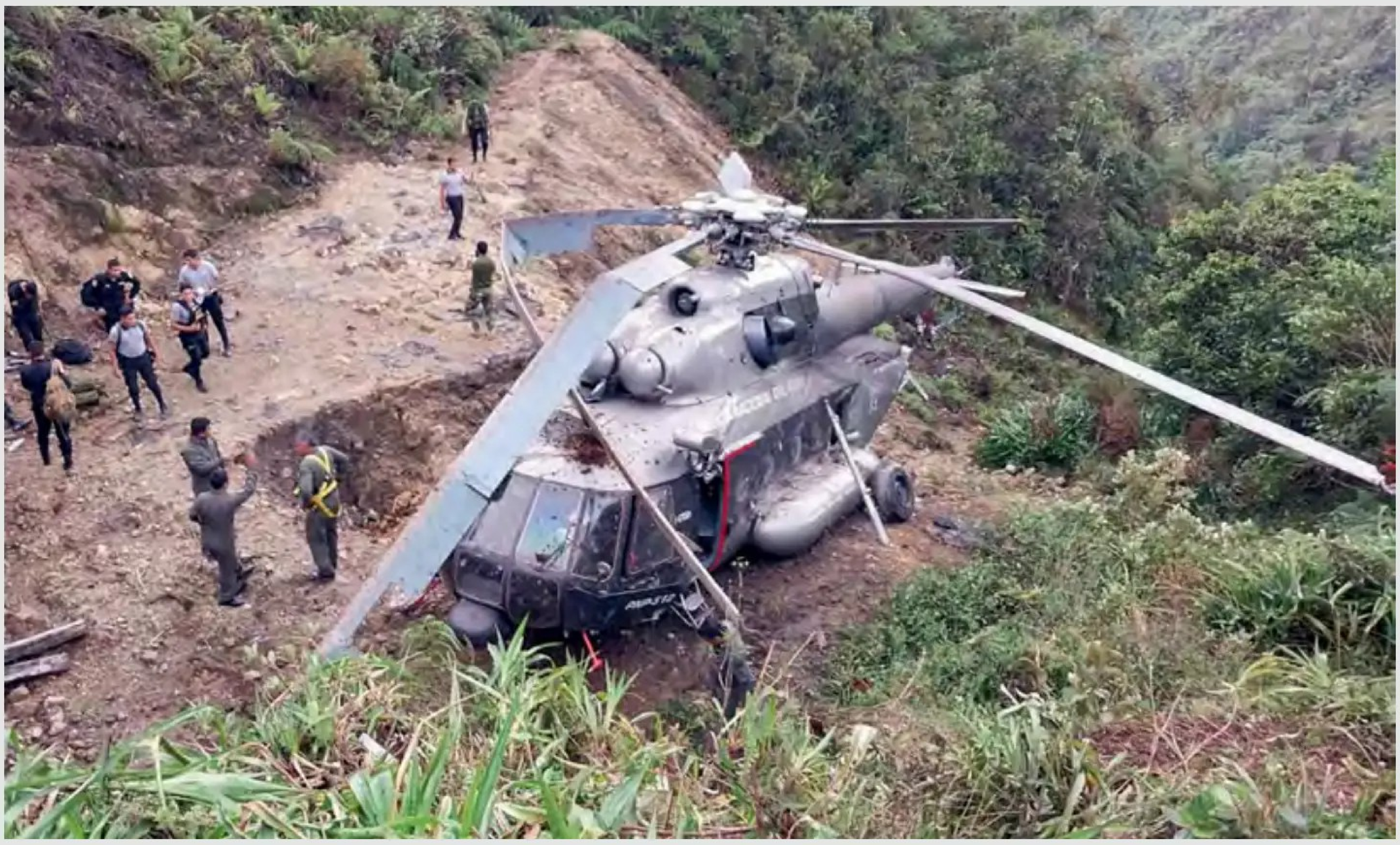
This aircraft was destroyed in a crash in fields near the runway at PAF Base Risalpur, Pakistan. The pilot was said to have been killed in the crash.

D: Jan 14
N: Belgian Defence-Air Component/1 Wing/18 Squadron
T: NH90 TTH
S: RN-07

During a low-level tactical training flight from Beauvechain Air Base, the helicopter, callsign 'ARES501', struck and severed power lines at around 1415hrs local time, causing a power outage in the nearby villages of Bonneville and Maizeret. Subsequently, some distance away, it made a precautionary landing in a field near Namêche. The four crew members were unhurt and the NH90 appeared to have sustained only minor damage to the nose cone.

D: Jan 14
N: Indian Navy
T: Adani Drishti-10 Starliner UAV

This UAV was undertaking a pre-delivery acceptance test flight by the manufacturer prior to being taken into Indian Navy service when communication with it was lost and it crashed into the sea off Porbandar, Gujarat. The wreckage was subsequently recovered to assist with investigation into the cause of the loss. The Drishti-10 is a variant of the Israeli Elbit 900 UAV built under licence in India by Adani Defence and



Peruvian National Police Mi-171Sh PNP-512 after making a hard landing near Base Militar Policial El Tambo, Peru, on January 16. *Dirección de Communicación Imagen Institucional*

The scattered remains of Islamic Republic of Iran Air Force/32nd Tactical Reconnaissance Squadron RF-4E Phantom II 2-6510/41730 after its crash on January 22 near Kabudarahang city via Twitter

Aerospace. Two were ordered for Indian Navy service through an emergency procurement initiative, with the first entering service in January 2024. The Indian Army also ordered two to improve surveillance along the Pakistani border, the first of them being delivered in June 2024. On January 15, Armasuisse announced that the Swiss Air Force ADS-15 variant of the Hermes 900 had been temporarily grounded after manufacturer Elbit had informed them of the incident with the Indian Navy example.

D: Jan 14
N: US Marine Corps/VMM-265
T: MV-22B Osprey

This tiltrotor, from Marine Corps Air Station Futenma, Japan, made a precautionary landing at 1548hrs local time at Okinoerabu Airport after a warning light illuminated in the cockpit while on a routine training flight. The fault was troubleshooted and would appear to have been quickly resolved, as the Osprey departed again at 1606hrs to head back to Futenma.

D: Jan 15
N: Iranian Police Aviation
T: Rockwell Commander 690

After departing from Rasht Airport on a training flight to Tehran, the aircraft was destroyed in a crash near the village of Kenarsar, Kuchesfahan. All three on board were killed.

D: Jan 16
N: Peruvian National Police
T: Mi-171Sh
S: PNP-512

The helicopter sustained substantial damage when it made a hard landing in a jungle clearing near Base Militar Policial El Tambo, Peru, during transfer of personnel from the Ciro Alegría military base, in Santa María de Nieva, to the EP Surveillance Post No 4 in the district of Cenepa, Amazonas. None of the 11 PNP officers on board were seriously injured and although the helicopter remained upright, the undercarriage collapsed, the rear of the tail boom was severed, the fuselage cracked just forward of the rear ramp and the main rotor blades smashed. The Mi-171 was providing support as part of the interdiction operations against illegal mining in the province of Condorcanqui, Amazonas. Failure of the transmission to the tail rotor is suspected as the cause of the accident.

D: Jan 17
N: Royal Air Force
T: Typhoon FGR4

During a sortie from its base at RAF Coningsby, Lincolnshire, a pylon and the Litening targeting pod the Typhoon was carrying detached from the aircraft and fell into an open field near Haisthorpe, East Yorkshire. Local police guarded the debris until it was recovered by RAF personnel on January 19. Although the RAF confirmed a pylon had fallen from the aircraft, no mention was made of the targeting pod. However, images shared online appear to show the remains of the pod.

D: Jan 20
N: Royal Air Force
T: F-35B Lightning II

During a sortie from its base at RAF Marham, Norfolk, the aircraft was involved in a bird strike over North Wales. The pilot was, however, able to fly safely back to Marham and land without further incident at 1326hrs local time. Damage to the airframe is thought to have been only minor and confined to the forward section of the F-35.

D: Jan 21
N: Republic of China Air Force/3rd Tactical Fighter Wing
T: AIDC F-CK-1 Ching-Kuo
S: 1504 95-8136

After landing at Taichung-Ching Chuan Kang Air Force Base, the aircraft was being moved to a hangar and moments before engine shut down a RoCAF officer, chief sergeant Hu, was conducting a routine final inspection when she was sucked into the starboard engine through the intake on that side. Although rushed to hospital with severe head injuries, she was subsequently pronounced dead.

D: Jan 22
N: Islamic Republic of Iran Air Force/32nd Tactical Reconnaissance Squadron
T: RF-4E Phantom II
S: 2-6510/41730 (applied as '01730')

During a sortie from the 3rd Tactical Air Base at Hamadan-Nojeh the aircraft was destroyed in a crash at around 1030hrs local time near Kabudarahang city, Hamadan, Iran. Both crew members ejected and sustained only minor injuries.

D: Jan 23
N: Royal Air Force/XI(F) Squadron
T: Typhoon FGR4
S: ZK306

During a sortie from RAF Coningsby, Lincolnshire, the aircraft suffered a suspected bird strike over the North Sea. The pilot then jettisoned the canopy and escorted by a second Typhoon, returned to Coningsby, where a safe emergency landing was made. The pilot was unhurt.

D: Jan 28
N: Libyan Air Force
T: Baykar Bayraktar Akinci UCAV

This high-altitude long endurance unmanned combat air vehicle was destroyed when it crashed under unknown circumstances near Ajaylat, Nuqat al Khams District, Tripolitania. The type is a new addition to the Libya inventory with the first example only delivered last year and based at Misrata.

D: Jan 28
N: US Air Force/354th Fighter Wing
T: F-35A Lightning II

While on approach to land at Eielson Air Force Base, Alaska, with the undercarriage extended, the pilot declared an emergency due to an in-flight malfunction. The aircraft then fell rapidly, rolling over from wingtip to wingtip several times before being destroyed when it exploded in a fireball on impact with the ground at 1249hrs local time within the perimeter of the base. The pilot ejected safely and was transported for further medical evaluation to the nearby Bassett Army Hospital, where he was said to be in stable condition.

Additional material from:
Donny Chan, Scramble/Dutch Aviation Society and Asagiri Yohko.

Wreckage of the fuselage of a Libyan Air Force Baykar Bayraktar Akinci UCAV after it crashed on January 28 near Ajaylat, Nuqat al Khams District, Tripolitania via Twitter

Next Issue

A shot which defines the NATO concept of 'Stronger together': two French Rafale Bs flying side by side with a pair of Italian F-2000As *Giovanni Colla and Remo Guidi*

- **Mountain guides**
For three weeks each year, pilots of Sweden's NH-90s work on their mountain training skills in Abisko, northern Sweden. The rugged terrain and harsh weather create challenging training scenarios, as Martin Scharenborg and Ramon Wenink discovered

- **Anarchy in Africa**
Islamic State and Al-Qaeda militants have made dramatic gains in Africa in the past three years. Al Vetner explains the crisis

- **Inside Combat Command**
AirForces Monthly takes an in-depth look at the role of Finland's fighter force as the nation takes on a greater role within NATO

- **Jihadi hunters**
Babak Taghvaee explains the role of the French Rafale B/Cs in the new phase of Operation Chammal in Iraq and Syria

Baltic defenders

Allies continue to safeguard NATO skies as Italy and France take over Baltic Air Policing Block 67 in Lithuania. **Giovanni Colla** and **Remo Guidi** report

NEXT ISSUE

The March issue is on sale from March 20, 2025

Mountain flying training is essential as Sweden's 1st Squadron is also tasked with combat search and rescue in hazardous high terrain *Martin Scharenborg and Ramon Wenink*

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